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Design Development Submittal
PROJECT MANUAL
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GENERAL CONDITIONS

The 2007 Edition of the General Conditions of the Contract for Construction, American Institute of Architects Document A-201, are hereby made part of this specification to the same extent as if bound herein.

Where the Supplementary Conditions conflict or contradict the AIA General Conditions, the Supplementary Conditions are to take precedence. Only those portion of the General Conditions specifically mentioned in the Supplementary Conditions shall be changed.

For those persons not familiar with or are without complete understanding of all the conditions as set forth in the 2007 AIA General Conditions, a copy of this document may be examined at the Architects office.

A copy of the 2007 IA General Conditions, along with all other Contract Documents shall be kept on the job site at all times.

SUPPLEMENTARY CONDITIONS TO THE CONTRACT FOR CONSTRUCTION

The following provisions replace, revise, delete from, or add to the provisions of the Standard Form of the General Conditions of the Contract for Construction, 2007 Edition, of the American Institute of Architects (AIA Documents No. A201), which document is hereby specifically made a part of the Contract Documents with the same force and effect as though set forth in full. Where any part of the AIA General Conditions is unaltered in these Supplemental Conditions, the unaltered provisions shall remain in effect.

ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Add the following sentence to the end of subparagraph 1.1.1:

The Contract Documents executed or identified in accordance with Subparagraph 1.5.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers.

Add the following subparagraph:

1.1.2.1 Where the project is located in a parish of the State of Louisiana, the Contractor, at his own expense, shall record the Contract and bond or bonds required with the Clerk of Court or the Recorder of Mortgages of that Parish before the work commences. Contractor shall give the book number and folio where they are recorded to the Architect and to the Owner.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following subparagraph:

1.2.4 In the case of conflicts or discrepancies between Drawings and Divisions 2-48 of the Specifications or within either Document not clarified by Addendum, the Architect will determine which takes precedence in accordance with Subparagraph 4.2.11.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER INSTRUMENTS OF SERVICE

Add the following subparagraph:

1.5.3 The Architect may, with the concurrence of the Owner, furnish to the contractor versions of Instruments of Service in electronic form. The Contract Documents executed or identified in accordance with Subparagraph 1.5.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers.

ARTICLE 2 OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.3 Add the following at the end of the first sentence:

“ . . . as well as establishing lot lines and a permanent benchmark.”

Delete Subparagraph **2.2.5** and substitute the following:

2.2.5 The Contractor will be furnished, free of charge, 10 copies of Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3 CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Add the following subparagraph:

3.2.5 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's requests for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, or Owner provided information, Contractor prepared coordination drawings, or prior Project correspondence or documentation.

3.4 LABOR AND MATERIALS

Delete subparagraph **3.4.2** and substitute the following:

3.4.2 After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications). By making requests for substitutions, the Contractor:

1. represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
2. represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
3. certifies that the cost data presented is complete and includes all related costs under this Contract, except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and
4. will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

Add the following subparagraph:

3.4.4 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect to evaluate the Contractor's proposed substitutions and to make agreed-upon changes in the Drawings and Specifications made necessary by the Owner's acceptance of such substitutions.

3.7 PERMITS, FEES, AND NOTICES AND COMPLIANCE WITH LAWS

Add the following subparagraphs:

3.7.6 The Contractor must be fully qualified under any state or local licensing law for Contractors in effect at the time and at the location of the work before submitting his bid. If the project is in the State of Louisiana, only the bids of Contractors and subcontractors duly licensed under Louisiana Revised Statutes 37:2151 et. seq. Will be considered if licensing is required by that law. The Contractor shall be responsible for determining that all of his subcontractors or prospective subcontractors are duly licensed in accordance with the law.

3.7.7 The requirements of subparagraph 3.7.2, 3.7.3, and 3.7.4 do not waive the Contractor's responsibility of complying with the requirements of the Contract Documents when such

requirements exceed those of any laws, codes, ordinances, rules, regulations, and lawful orders of any public authority bearing on the work.

3.9 SUPERINTENDENT

Add the following subparagraphs:

3.9.4 The superintendent shall be present at all times during construction operations of the work.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULE

3.10.1 Add the following subparagraph:

3.10.1.1 The Owner may authorize construction activities to commence prior to completion of the drawings and Specifications. If the Drawings and Specifications require further development at the time the initial construction schedule is prepared, the Contractor shall 1) allow time in the schedule for further development of the Drawings and Specifications by the Architect, including time for review by the Owner and Contractor and for the Contractor's coordination of Subcontractors' Work and 2) furnish to the Owner in a timely manner information regarding anticipated market conditions and construction costs; availability of labor, materials and equipment; and proposed methods and sequences and time schedules for construction of the Work.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

Add the following subparagraph:

3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

ARTICLE 7 CHANGES IN THE WORK

7.3 CONSTRUCTION CHANGE DIRECTIVES

Add the following subparagraph:

7.3.11 In subparagraph 7.3.7, the allowance for the combined overhead and profit included in a total cost to the Owner shall be based on the following schedule:

1. For the Contractor, for work performed by the Contractor's own forces, 15% of the total cost.
2. For the Contractor, for work performed by the Contractor's subcontractors, 10% of the amount due the subcontractors.
3. For each Subcontractor involved, for work performed by that Subcontractor's own forces, 15% of the cost.
4. For each Subcontractor involved, for work performed by the Subcontractor's Sub-subcontractors, 10% of the amount due the Sub-subcontractor.
5. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.6.
6. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied

by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over \$500 be approved without such itemization.

ARTICLE 8 TIME

8.2 PROGRESS AND COMPLETION

8.2.1 Add the following at the end of the subparagraph:

"Contract Time shall be based on consecutive calendar days. A calendar day is one of 24 hours beginning at 12:00 midnight."

ARTICLE 9 PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following subparagraphs:

9.2.1 The Schedule of Values form of submittal shall be AIA Document G703.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 Add the following at the end of this subparagraph:

The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703, Continuation Sheet. Computer printed payment application documents matching these forms from computer software recognized by the AIA are also permitted.

Add the following subparagraphs:

9.3.1.3 Until Substantial Completion, the Owner shall pay 90% of the amount due the contractor on account of progress payments.

9.3.4 When applying for payment, the Contractor shall submit to the Architect an original and three (3) copies of his application for payment. Each of these copies must contain an original hand signature by an authorized officer of the Contractor's firm.

9.6 PROGRESS PAYMENTS

Add the following subparagraph:

9.6.8 Upon commencement of the Work, an escrow account for retained funds shall be established in accordance with Louisiana Revised Statute 9:4815 at a qualified financial institution and shall be under the control of an escrow agent. Funds shall be administered and released in accordance with the referenced statute and contract documents. In connection with the retainage escrow account, the parties shall enter into a retainage escrow agreement, attached hereto as Exhibit C.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Add the following subparagraph:

9.8.1.1 RS 9:4802.1 of the Louisiana Legislature permits the Owners to accept the contract "Substantially Complete" when construction has been completed to the extent that the building can be used for its intended purpose. If the Owners agree to accept the contract as "Substantially Complete," the Architect will prepare a "Substantial Completion" form, which will exclude that portion of the work, which has not been completed or needs to be corrected at that time. The value of the incomplete or incorrect work shall be determined by the Architect and shall be noted on a copy of the "punch list" which will be prepared after an inspection has been made. A copy of this "punch list" will be attached to and made a part of the "Substantial Completion Acceptance" which the Contractor will record with the Clerk-of-Court of the respective parish.

At the time of "Substantial Completion Acceptance," the Owner will pay the Contractor for the original contract amount, adjusted for any change orders written during construction, less the total value of the incomplete or incorrect work as valued by the Architect, less ten (10%) percent of that portion of the contract that has been completed.

If the Contractor does not complete the "punch list" work during the 30-or-45 day lien period, the Owners may incur additional expense. The expense, including but not limited to the additional services of the Architect required, possible legal cost, will also be paid out of the balance owed the first contractor. Therefore, the total additional cost which may be involved in obtaining a second contractor to complete the first contractor's work will be paid for out of the remaining punch list balance due the original contractor. Any monies left over after all of these expenses are paid will then be paid the first contractor.

9.8.3 Add the following subparagraph:

9.8.3.1 Except with the consent of the Owner, the Architect will perform no more than two (2) inspections to determine whether the work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.2 Add the following subparagraphs:

9.10.2.1 In Louisiana, and in those states having statutes relating to liens on private and public works similar to those in Louisiana, neither the final payment nor any part of the retained percentage shall become due until the Contractor delivers to the Owner a certificate by the Clerk of Court in the parish in which the project is located that the Owner's Substantial Completion certificate has been recorded, more than 30 days has elapsed since the recordation in the case of private works, and more than 45 days has elapsed since the recordation in the case of public works, and no liens have been recorded affecting this property and all affidavits, consents and releases specified in subparagraph 9.9.2 have been submitted to the Architect.

ARTICLE 11 INSURANCE AND BONDS

11.1.2 Add the following subparagraphs:

11.1.2.1 Commercial General Liability Insurance: All coverage options must be included. Minimum limits of liability are as follows:

Bodily Injury Liability	\$1,000,000 each person
.....	\$1,000,000 each occurrence
Property Damage Liability	\$1,000,000 each occurrence
.....	or
.....	\$1,000,000 CSL (combined single limit)
Minimum Required General Liability Aggregate.....	\$2,000,000

11.1.2.2 Workmen's Compensation and Employer's Liability Insurance affording coverage under the statutory provisions of the workmen's compensation laws and any other compensation provisions of the workmen's pertaining to the operations to be performed under this Contract, and Employer's Liability Insurance with a minimum limit of \$100,000 per accident. In the case of sublet, Contractor shall require subcontractors to provide similar insurance unless it is his intent that such insurance be afforded under his policies.

11.1.2.2.1 Standard Workers Compensation and Employers Liability: The Certificate shall specifically show under Coverage A the States to which the insurance applies. Coverage B limits for Employers Liability shall be at least the following and must meet statutory requirements:

Bodily Injury by Accident.....	\$100,000 each accident
Bodily Injury by Disease.....	\$100,000 each employ
Bodily Injury by Disease.....	\$500,000 policy limit

Coverage C, Other States Insurance, shall be included. If applicable, U.S. Longshoremen's and Harbor Worker's Compensation Act Endorsement shall be certified.

11.1.2.3 Comprehensive Automobile Liability: All coverage options must be included, with the exception of "Garage Liability," where not applicable. Minimum limits of liability are as follows:

Bodily Injury and Property	\$1,000,000 each person
Damage Liability.....	\$1,000,000 each accident
.....	or
.....	\$1,000,000 CSL (combined single limit)

11.2 OWNER'S LIABILITY INSURANCE: Delete in it's entirety and substitute the following:

11.2 OWNER'S AND CONTRACTOR'S PROTECTIVE LIABILITY INSURANCE (OCP)

11.2.1 The Contractor shall purchase and maintain until final acceptance of the work an Owner's Protective Liability Policy, with no deductible, in which the Architect and his consultants shall be named as an additional insured, protecting the insured against liability arising from operations under the contract. This policy shall not cover liability arising from errors in drawings and specifications prepared by the Architect. The policy shall provide the same minimum limits of liability as required for the Contractor's Comprehensive General Liability Policy in 11.1.2.

11.4 PERFORMANCE BOND AND PAYMENT BOND

The contractor will not be required to provide a Performance Bond and Payment Bond.

ARTICLE 14 – TERMINATION OR SUSPENSION OF THE CONTRACT

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.5 Add the following subparagraph:

14.2.5 If an agreed sum of liquidated damages has been established, termination by the Owner under this article will not relieve the Contractor of his obligations under the liquidated damages provisions and the Contractor shall be liable to the Owner for per diem liquidated damages.

15.1 CLAIMS AND DISPUTES

15.1.5 Claims for Additional Time

Delete subparagraph 15.1.5.2 and substitute the following:

15.1.5.2 If adverse weather conditions are the basis for a claim for additional time, the Contractor shall document that weather conditions had an adverse effect on the scheduled construction. An increase in the contract time due to weather shall not be cause for an increase in the contract sum.

Add the following subparagraphs:

15.1.5.3 The following are considered reasonably anticipated days of adverse weather on a monthly basis:

January..... 11 days	May.....5 days	September 4 days
February..... 10 days	June.....6 days	October 3 days
March 8 days	July.....6 days	November..... 5 days
April.....7 days	August5 days	December 8 days

The Contractor shall ask for total adverse weather days, the Contractor's request shall be considered only for days over the allowable numbers of days stated above.

Note: Contract is on a calendar day basis.

15.1.5.4 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances form the basis of the Claim.

15.1.5.5 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the work, or for concurrent delays due to the fault of the Contractor.

END OF SUPPLEMENTAL CONDITIONS TO THE CONTRACT FOR CONSTRUCTION

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Work by Owner.
- 4. Access to site.
- 5. Work restrictions.
- 6. Specification and drawing conventions.

- B. Related Requirements:

- 1. Section 01500 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: One Lakeshore Place
- B. Project Locations: 940 Stanford Avenue, Baton Rouge, LA
- C. Owner: Wampold Companies, 4171 Essen Lane, Suite 450, Baton Rouge, Louisiana 70809
- D. Drawings: The Contract Documents, _____, were prepared for the Project by Coleman Partners Architects, LLC. 3377 North Blvd, Baton Rouge, LA 70806.
- E. Project Web Site: A project web-page administered by Architect will be used for purposes of managing communication and documents during the construction stage.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. New apartment complex and Precast Concrete Parking Garage

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

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

1.6 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Controlled Substances: Use of tobacco products and other controlled substances within the interior/conditioned spaces of the existing building is not permitted.
- C. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.

1.3 SELECTION AND PURCHASE

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

1.4 COORDINATION

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

1.5 **LUMP-SUM** ALLOWANCES

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

- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials **selected by Architect** under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.6 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Lump-Sum Allowance: Include the sum of \$22,000 for interior room signage (Apartment numbering, public space room signs and toilet room signage). Signage design and manufacture information will be issued by architect at a later date.
 - 1. This allowance includes material cost, receiving, handling, and installation, and Contractor overhead and profit.

- B. Allowance No. 2: Lump-Sum Allowance: Include the sum of \$120,000 for draperies in the residential units (248 window and door locations of various widths). Drapery components/design information will be issued by architect at a later date.
 - 1. This allowance includes material cost, receiving, handling, and installation, and Contractor overhead and profit.

- C. Allowance No. 3: Lump-Sum Allowance: Include the sum of \$50,000 for upgrade of finishes for the elevators and elevator lobby doors and the ground floor and floors nine through 16. Finish selections/design information will be issued by architect at a later date.
 - 1. This allowance includes material cost, receiving, handling, and installation, and Contractor overhead and profit.

END OF SECTION 01210

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.

- d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.5 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01250

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Contractor's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

- a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Change Orders (numbers) that affect value.
 - d. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
 8. Schedule Updating: Update and resubmit the Schedule of Values with each Applications for Payment. Schedule shall maintain baseline schedule, as well as, current status of the work including Change Orders or Construction Change Directives that result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment. **In addition, the contractor shall attach progress photographs which document the current conditions on the job on the date of the application.**
- C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect may return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- D. Transmittal: Submit **3** signed and notarized original copies of each Application for Payment to Architect. Each copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- E. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
- G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

- H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).

1.3 DEFINITIONS

- 1. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.

2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

1.5 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
 3. Number of Copies: Submit three opaque copies of each submittal. Architect will return one copy.
 - a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
 5. Refer to Division-15 Section "Basic Mechanical Requirements," and Division-16 Section "Basic Electrical Requirements" for specific coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: Within 15 days of Notice to Proceed, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list address and telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within **3** days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **15** days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
- D. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 3. Reporting: No later than 3 days after each progress meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: CSI Form 13.2A.
1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly as needed and at each progress meeting. Software log with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Daily construction reports.
 - 3. Field condition reports.

1.3 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Contractor's Construction Schedule: Submit printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.
- C. Daily Construction Reports: Submit copies at monthly intervals.
- D. Field Condition Reports: Submit copies at time of discovery of differing conditions.

1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 4. Startup and Testing Time: Include necessary days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.2 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. High and low temperatures and general weather conditions.
 - 5. Accidents.
 - 6. Meetings and significant decisions.

7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of authorities having jurisdiction.
 12. Change Orders received and implemented.
 13. Construction Change Directives received.
 14. Services connected and disconnected.
 15. Equipment or system tests and startups.
 16. Partial Completions and occupancies.
 17. Substantial Completions authorized.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A or similar form. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01320

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent

- submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Allow 15 days for processing each resubmittal.
 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately **4 by 5 inches (100 by 125 mm)** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Use AIA Document G810 or similar form approved by Architect.

- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Number of Copies: Submit one copy (hard copy – paper) and one electronic version in PDF format of each submittal, unless otherwise indicated. Architect will return one copy. An electronic copy will be posted on the architect's website for use by the contractor, subcontractors, suppliers and the owner. Mark up and retain one returned copy as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Wiring diagrams showing factory-installed wiring.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.

- j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
- D. Samples: Prepare physical units of materials or products, including the following:
 1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
 5. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:
 - a. Size limitations.
 - b. Compliance with recognized standards.
 - c. Availability.
 - d. Delivery time.
 6. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
 - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

7. Number of Samples for Initial Selection: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
8. Number of Samples for Verification: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
9. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- E. Application for Payment: Comply with requirements in Division 1 Section "Payment Procedures."
- F. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."
- G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."

- B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."
- N. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
 - 1. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken
- B. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Reports: Prepare and submit certified written reports that include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Ambient conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

- F. **Testing Agency Qualifications:** An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
- G. **Preconstruction Testing:** Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
 - d. When testing is complete, remove assemblies; do not reuse materials on Project.
 - 2. **Testing Agency Responsibilities:** Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- H. **Mockups:** Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

- A. **Owner Responsibilities:** Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. **Contractor Responsibilities:** Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 5. Testing agency will retest and reinspect corrected work.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.
 5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
 2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, **Owner's construction forces**, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: **Pay** sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: **Pay** water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: **Pay** electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with

water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

- C. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste handling procedures.
 5. Other dust-control measures.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- B. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).
- C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading or temp office space within the existing building.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.

2. Drinking water and private toilet.
 3. Coffee machine and supplies.
 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
- C. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- D. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating **and Cooling**: Provide temporary heating **and cooling** required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install **one** telephone line(s) for each field office.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 - 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.

- c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within **30 feet (9 m)** of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: **Use designated areas of Owner's existing** parking areas for construction personnel.

D. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01700 "Execution Requirements."

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

- G. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
 - 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- H. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

- F. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
 - 1. Construct covered walkways using scaffold or shoring framing.
 - 2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 - 3. Paint and maintain appearance of walkway for duration of the Work.

- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

- H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by **Owner** from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 3. Protect air-handling equipment.
 - 4. Provide walk-off mats at each entrance through temporary partition.

- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for **48** hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for **48** hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within **48** hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01770 "Closeout Procedures."

END OF SECTION 01500

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
NOTE: ALL MATERIALS AND EQUIPMENT TO BE INSTALLED IN THIS PROJECT TO BE SHALL BE "NEW". SALVAGED OR USED PRODUCTS WILL NOT BE ACCEPTED UNLESS SPECIFICALLY NOTED IN THE CONTRACT DOCUMENTS.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- B. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity; Speed; Ratings.

1.5 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 - 3. Initial Submittal: Within **15** days after date of commencement of the Work, submit **3** copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 - 4. Completed List: Within **30** days after date of commencement of the Work, submit **3** copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - 5. Architect's Action: Architect will respond in writing to Contractor within **5** days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack

of response, does not constitute a waiver of requirement to comply with the Contract Documents.

- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use CSI Form 13.1A.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **7** days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **7** days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request.

Architect will notify Contractor of approval or rejection of proposed comparable product request within **15** days of receipt of request, or **7** days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
- b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 5. Store materials in a manner that will not endanger Project structure.
 - 6. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 7. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 8. Protect stored products from damage.
- B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 2. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 3. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.

2.2 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS:

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
- B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.

1.3 SUBMITTALS

- A. Final Property Survey: Submit 2 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than seven days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of **8 feet (2.4 m)** in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, contractor shall . Fit exposed connections together to form hairline joints. Where joints required by manufacturer's requirements are not shown on drawings, contractor shall coordinate final layout with Architect prior to commencement of work.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
 - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment to the satisfaction of the architect..
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01700

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project Record Documents.
 - 3. Operation and maintenance manuals.
 - 4. Warranties.
 - 5. Instruction of Owner's personnel.
 - 6. Final cleaning.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Advise Owner of changeover in heat and other utilities.
 - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 13. Complete final cleaning requirements, including touchup painting.
 - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 - 1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
 - 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report and warranty.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit **three** copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.6 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
 6. Contractor shall submit electronic files of sprinkler, fire alarm and other submittals that were generated utilizing AutoCAD.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Note related Change Orders, Record Drawings and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Drawings and Record Specifications, where applicable.
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.
 2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 3. Schedule training with Owner with at least **seven** days' advance notice.
 - 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
 - 1. System design and operational philosophy.
 - 2. Review of documentation.
 - 3. Operations.
 - 4. Adjustments.
 - 5. Troubleshooting.
 - 6. Maintenance.
 - 7. Repair.

3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to unusual operating conditions.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

SECTION 02361 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Soil treatment with termiticide beneath all building slabs on grade.

1.3 SUBMITTALS

- A. Product Data: For each type of termite control product.
 - 1. Include the EPA-Registered Label for termiticide products.
- B. Qualification Data: For qualified Installer.
- C. Product Certificates: For termite control products, from manufacturer.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Termiticide brand name and manufacturer.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes used, and rates of application.
 - 6. Areas of application.
 - 7. Water source for application.
- E. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located, and who employs workers trained and approved by manufacturer to install manufacturer's products.
- B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

- C. Source Limitations: Obtain termite control products from single source from single manufacturer.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
- B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.6 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation, Agricultural Products; Termidor.
 - b. Bayer Environmental Science; Premise 75.
 - 2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces

with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

- B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
 - 1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
 - 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

- C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 02361

SECTION 03163 - DRILLED CONCRETE PIERS AND SHAFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Dry-installed drilled piers.

1.3 UNIT PRICES

- A. Drilled Piers: Actual net volume of drilled piers in place and approved. Actual length, shaft diameter, and bell diameter if applicable, may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments are made on net variation of total quantities, based on design dimensions for shafts and bells.
 - 1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft.
 - 2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to drilled piers including, but not limited to, the following:
 - a. Review geotechnical report.
 - b. Discuss existing utilities and subsurface conditions.
 - c. Review coordination with temporary controls and protections.
 - d. Review measurement and payment of unit prices.

1.5 ACTION SUBMITTALS

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

- B. Design Mixtures: For each concrete mixture. Submit alternative design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Shop Drawings: For concrete reinforcement, detailing fabricating, bending, supporting, and placing.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Welding certificates.
- C. Material Certificates: From manufacturer, for the following:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
- D. Material Test Reports: For each material below, by a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Record drawings.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work.
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077, ASTM D 3740, and ASTM E 329 for testing indicated.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

1.9 FIELD CONDITIONS

- A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.

1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.
- B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 1. Notify Structural Engineer, Architect and Owner no fewer than two days in advance of proposed interruption of utility.
 2. Do not proceed with interruption of utility without Structural Engineer's and/or Owner's written permission.
- C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
 1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
 2. The geotechnical report is included referenced elsewhere in the Project Manual.
- D. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
 1. Record and maintain information pertinent to each drilled pier and indicate on record Drawings. Cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Drilled-Pier Standard: Comply with ACI 336.1 except as modified in this Section.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150/C 150M, Type I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregate: ASTM C 33/C 33M, graded, 3/4-inch-nominal maximum coarse-aggregate size. Provide aggregate from a single source.
 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Sand-Cement Grout: Portland cement, ASTM C 150/C 150M, Type II; clean natural sand, ASTM C 404; and water to result in grout with a minimum 28-day compressive strength of 1000 psi (6.9 MPa), of consistency required for application.

2.4 STEEL CASINGS

- A. Steel Pipe Casings: ASTM A 283/A 283M, Grade C, or ASTM A 36/A 36M, carbon-steel plate, with joints full-penetration welded according to AWS D1.1/D1.1M.
- B. Corrugated-Steel Pipe Casings: ASTM A 929/A 929M, steel sheet, zinc coated.
- C. Liners: Comply with ACI 336.1.

2.5 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 (ACI 301M) limits as if concrete were exposed to deicing chemicals.
- C. Limit water-soluble, chloride-ion content in hardened concrete to [0.15] [0.30] percent by weight of cement.
- D. Proportion normal-weight concrete mixture as follows:
 1. Compressive Strength (28 Days): Refer to structural drawings.

2. Maximum Water-Cementitious Materials Ratio: Refer to structural drawings.
3. Minimum Slump: Capable of maintaining the following slump until completion of placement:
 - a. 4 inches for dry, uncased, or permanent-cased drilling method.
 - b. 6 inches for temporary-casing drilling method..
4. Air Content: Do not air entrain concrete.

2.6 REINFORCEMENT FABRICATION

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

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.2 EXCAVATION

- A. Classified Excavation: Excavation is classified as standard excavation, special excavation, and obstruction removal and includes excavation to bearing elevations as follows:
 1. Standard excavation includes excavation accomplished with conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work.
 2. Special excavation includes excavation that requires special equipment or procedures where drilled-pier excavation equipment used in standard excavation, operating at maximum power, torque, and downthrust, cannot advance the shaft.
 - a. Special excavation requires use of special rock augers, core barrels, air tools, blasting, or other methods of hand excavation.
 - b. Earth seams, rock fragments, and voids included in rock excavation area are considered rock for full volume of shaft from initial contact with rock.

3. Obstructions: Payment for removing unanticipated boulders, concrete, masonry, or other subsurface obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work is according to Contract provisions for changes in the Work.
- B. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.
- C. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
 1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
 2. Remove water from excavated shafts before concreting.
 3. Cut series of grooves about perimeter of shaft to height from bottom of shaft, vertical spacing, and dimensions indicated.
- D. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by the Structural Engineer.
 1. Do not excavate shafts deeper than elevations indicated unless approved by Structural Engineer.
 2. Payment for additional authorized excavation is according to Contract provisions for changes in the Work.
- E. Excavate shafts for closely spaced drilled piers and for drilled piers occurring in fragile or sand strata only after adjacent drilled piers are filled with concrete and allowed to set.
- F. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
 1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete, or leave temporary casings in place.
- G. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
 1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit corrective construction proposals to the Structural Engineer for review before proceeding.

3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.
- C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.

- D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement.
- E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.
- F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4 CONCRETE PLACEMENT

- A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by a qualified Special Inspector or testing agency.
 - 1. Construct a construction joint if concrete placement is delayed more than one hour. Level top surface of concrete and insert joint dowel bars. Before placing remainder of concrete, clean surface laitance, roughen, and slush concrete with commercial bonding agent or with sand-cement grout mixed at ratio of 1:1.
- B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.
 - 1. Where concrete cannot be directed down shaft without striking reinforcement, place concrete with chutes, tremies, or pumps.
 - 2. Vibrate top 60 inches of concrete.
- C. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing.
 - 1. Vibrate top 60 inches of concrete after withdrawal of temporary casing.
- D. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.
- E. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.
- F. If hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no more than 90 deg F (32 deg C).
 - 1. Place concrete immediately on delivery. Keep exposed concrete surfaces and formed shaft extensions moist by fog sprays, wet burlap, or other effective means for a minimum of seven days.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Drilled piers.
 - 2. Excavation.
 - 3. Concrete.
 - 4. Steel reinforcement.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.
 - 1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities are determined by testing and inspecting agency. Final evaluations and approval of data are determined by the Structural Engineer.
 - a. Bearing Stratum Tests: Testing agency takes undisturbed hardpan rock core samples from drilled-pier bottoms; tests each sample for compression, moisture content, and density; and reports results and evaluations.
- D. Concrete Tests and Inspections: ASTM C 172/C 172M except modified for slump to comply with ASTM C 94/C 94M.
 - 1. Slump: ASTM C 143/C 143M; one test at point of placement for each compressive-strength test but no fewer than one test for each concrete load.
 - 2. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 - 3. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens unless field-cured test specimens are required.
 - 4. Compressive-Strength Tests: ASTM C 39/C 39M; one set for each drilled pier but not more than one set for each truck load. Test one specimen at seven days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.
 - 5. If frequency of testing provides fewer than five strength tests for a given class of concrete, conduct tests from at least five randomly selected batches or from each batch if fewer than five are used.
 - 6. If strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - 7. Strength of each concrete mixture is satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 - 8. Report test results in writing to Architect, Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. List Project identification

- name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests in reports of compressive-strength tests.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Structural Engineer but not be used as sole basis for approval or rejection of concrete.
 10. Additional Tests: Testing and inspecting agency to make additional tests of concrete if test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by the Structural Engineer.
 - a. Continuous coring of drilled piers may be required, at Contractor's expense, if temporary casings have not been withdrawn within specified time limits or if observations of placement operations indicate deficient concrete quality, presence of voids, segregation, or other possible defects.
 11. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
 12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. An excavation, concrete, or a drilled pier will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports for each drilled pier as follows:
1. Actual top and bottom elevations.
 2. Actual drilled-pier diameter at top and bottom.
 3. Top of rock elevation.
 4. Description of soil materials.
 5. Description, location, and dimensions of obstructions.
 6. Final top centerline location and deviations from requirements.
 7. Variation of shaft from plumb.
 8. Shaft excavating method.
 9. Design and tested bearing capacity of bottom.
 10. Levelness of bottom and adequacy of cleanout.
 11. Ground-water conditions and water-infiltration rate, depth, and pumping.
 12. Description, purpose, length, wall thickness, diameter, tip, and top and bottom elevations of temporary or permanent casings. Include anchorage and sealing methods used and condition and weather tightness of splices if any.
 13. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
 14. Date and time of starting and completing excavation.
 15. Inspection report.
 16. Condition of reinforcing steel and splices.
 17. Position of reinforcing steel.
 18. Concrete placing method, including elevation of consolidation and delays.
 19. Elevation of concrete during removal of casings.
 20. Locations of construction joints.
 21. Concrete volume.
 22. Concrete testing results.
 23. Remarks, unusual conditions encountered, and deviations from requirements.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 316329

SECTION 03300 - CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Suspended slabs.
 - 5. Concrete toppings.
 - 6. Building frame members.
 - 7. Building walls.
- B. Related Sections:
 - 1. Section 03530 "Concrete Topping" for emery- and iron-aggregate concrete floor toppings.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup

spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Structural Engineer.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. **Installer Qualifications:** A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. **Testing Agency Qualifications:** An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. **Welding Qualifications:** Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. **ACI Publications:** Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. **Concrete Testing Service:** Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. **Preinstallation Conference:** Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Epoxy-Coated Reinforcing Bars: ASTM A 615/A615 M, Grade 60 (Grade 420), deformed bars, ASTM A 775/A 775 M, epoxy coated with less than 2 percent damaged coating in each 12-inch length.
- C. Deformed-Steel Wire: ASTM A 496/A 496M.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.

- D. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CN-Cl₂
 - b. BASF Construction Chemicals - Building Systems; Rheocrete CNI₂
 - c. Euclid Chemical Company (The), an RPM company; ARRMATECT, EUCON BCN and EUCON CIA.
 - d. Grace Construction Products, W. R. Grace & Co.; DCI₂
 - e. Sika Corporation; Sika CNI₂
- D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
 - b. Cortec Corporation; MCI- 2005NS.
 - c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - d. Sika Corporation; FerroGard 901.

2.6 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; MiraSTOP.
 - b. CETCO; Volclay Waterstop-RX.
 - c. Concrete Sealants Inc.; Conseal CS-231.
 - d. Greenstreak; Swellstop.
 - e. Henry Company, Sealants Division; Hydro-Flex.
 - f. JP Specialties, Inc.; Earth Shield Type 20.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
 - b. Fortifiber Building Systems Group; Moistop Ultra 10.
 - c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - d. Insulation Solutions, Inc.; Viper VaporCheck 10.
 - e. Meadows, W. R., Inc.; Perminator 10 mil.
 - f. Raven Industries Inc.; Vapor Block 10.
 - g. Reef Industries, Inc.; Griffolyn 10 mil Green.
 - h. Stego Industries, LLC; Stego Wrap 10 mil Class A.
- B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.
- C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- D. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.8 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing,

moisture, and cleaning materials with 100 percent passing 3/8-inch No. 4 (4.75-mm) No. 8 (2.36-mm) sieve.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anti-Hydro International, Inc.; Emery.
 - b. Dayton Superior Corporation; Emery Tuff Non-Slip.
 - c. Lambert Corporation; EMAG-20.
 - d. L&M Construction Chemicals, Inc.; Grip It.
 - e. Metalcrete Industries; Metco Anti-Skid Aggregate.

B. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anti-Hydro International, Inc.; A-H Alox.
 - b. BASF Construction Chemicals - Building Systems; Frictex NS.
 - c. L&M Construction Chemicals, Inc.; Grip It AO.
 - d.

C. Emery Dry-Shake Floor Hardener: Unpigmented, factory-packaged, dry combination of portland cement, graded emery aggregate, and plasticizing admixture; with emery aggregate consisting of no less than 60 percent of total aggregate content.

1. Color: As selected by Architect from manufacturer's full range.

2.9 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ChemMasters; Chemisil Plus.
 - b. ChemTec Int'l; ChemTec One.
 - c. Conspec by Dayton Superior; Intraseal.
 - d. Curecrete Distribution Inc.; Ashford Formula.
 - e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
 - f. Edoco by Dayton Superior; Titan Hard.
 - g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
 - h. Kaufman Products, Inc.; SureHard.
 - i. L&M Construction Chemicals, Inc.; Seal Hard.
 - j. Meadows, W. R., Inc.; LIQUI-HARD.
 - k. Metalcrete Industries; Floorsaver.

- l. Nox-Crete Products Group; Duro-Nox.
 - m. Symons by Dayton Superior; Buff Hard.
 - n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
 - o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.
- C. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advanced Floor Products; Retro-Plate 99.
 - b. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
 - c. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

2.10 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
 - b. BASF Construction Chemicals - Building Systems; Confilm.
 - c. ChemMasters; SprayFilm.
 - d. Conspec by Dayton Superior; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film (J-74).
 - f. Edoco by Dayton Superior; BurkeFilm.
 - g. Euclid Chemical Company (The), an RPM company; Eucobar.
 - h. Kaufman Products, Inc.; Vapor-Aid.
 - i. Lambert Corporation; LAMBCO Skin.
 - j. L&M Construction Chemicals, Inc.; E-CON.
 - k. Meadows, W. R., Inc.; EVAPRE.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group; MONOFILM.
 - n. Sika Corporation; SikaFilm.
 - o. SpecChem, LLC; Spec Film.
 - p. Symons by Dayton Superior; Finishing Aid.
 - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
 - r. Unitex; PRO-FILM.
 - s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.
- B. Water: Potable.
- C. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. BASF Construction Chemicals - Building Systems; Kure-N-Seal 25 LV.
 - b. ChemMasters; Spray-Cure & Seal Plus.
 - c. Conspec by Dayton Superior; Sealcure 1315.
 - d. Dayton Superior Corporation; Day-Chem Cure and Seal (J-22UV).
 - e. Edoco by Dayton Superior; Cureseal 1315.
 - f. Euclid Chemical Company (The), an RPM company; Super Diamond Clear; LusterSeal 300.
 - g. Kaufman Products, Inc.; Sure Cure 25.
 - h. Lambert Corporation; UV Super Seal.
 - i. L&M Construction Chemicals, Inc.; Lumiseal Plus.
 - j. Meadows, W. R., Inc.; CS-309/30.
 - k. Metalcrete Industries; Seal N Kure 30.
 - l. Right Pointe; Right Sheen 30.
 - m. Vexcon Chemicals, Inc.; Certi-Vex AC 1315.
2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 1. Types I and II, non-load bearing for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 20 percent
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: Refer to drawings.
 2. Maximum Water-Cementitious Materials Ratio: Refer to drawings.
 3. Slump Limit: Refer to drawings.
 4. Air Content: Refer to drawings.
- B. Foundation Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: Refer to drawings.
 2. Maximum Water-Cementitious Materials Ratio: Refer to drawings.
 3. Slump Limit: Refer to drawings.
 4. Air Content: Refer to drawings.
- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: Refer to drawings.
 2. Maximum Water-Cementitious Materials Ratio: Refer to drawings.
 3. Slump Limit: Refer to drawings.
 4. Air Content: Refer to drawings.
- D. Suspended Slabs: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: Refer to drawings.
 2. Maximum Water-Cementitious Materials Ratio: Refer to drawings.
 3. Slump Limit: Refer to drawings.
 4. Air Content: Refer to drawings.
- E. Suspended Slabs: Proportion structural lightweight concrete mixture as follows:
1. Minimum Compressive Strength: Refer to drawings.
 2. Maximum Water-Cementitious Materials Ratio: Refer to drawings.
 3. Slump Limit: Refer to drawings.
 4. Air Content: Refer to drawings.
- F. Concrete Toppings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: Refer to drawings.
 2. Maximum Water-Cementitious Materials Ratio: Refer to drawings.
 3. Slump Limit: Refer to drawings.
 4. Air Content: Refer to drawings.
- G. Building Frame Members: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: Refer to drawings.
 2. Maximum Water-Cementitious Materials Ratio: Refer to drawings.
 3. Slump Limit: Refer to drawings.
 4. Air Content: Refer to drawings.
- H. Building Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: Refer to drawings.
 2. Maximum Water-Cementitious Materials Ratio: Refer to drawings.
 3. Slump Limit: Refer to drawings.

4. Air Content: Refer to drawings.

2.15 FABRICATING REINFORCEMENT

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

2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.

- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

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

hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Structural Engineer.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturers recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

C. Granular Course: Cover vapor retarder with granular fill, fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

1. Place and compact a 1/2-inch-thick layer of fine-graded granular material over granular fill.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
- G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Structural Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-third of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the Structural Engineer.

- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature,

provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated.
 - C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated.
 - D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155 for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 - E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
 - F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- 3.12 MISCELLANEOUS CONCRETE ITEMS
- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
 - B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 5000 psi (34.5 MPa) at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

- a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
2. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one to six month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by the Structural Engineer. Remove and replace concrete that cannot be repaired and patched to the Structural Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the Structural Engineer.

- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to the Structural Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to the Structural Engineer's approval.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:

1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
11. Test results shall be reported in writing to Architect, the Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Structural Engineer but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by the Structural Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by the Structural Engineer.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

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

END OF SECTION 033000

SECTION 03381 - UNBONDED POST-TENSIONED CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Post-tensioning reinforcement and accessories including prestressing tendons, pocket formers, support bars, bar chairs, and slab bolsters.
 - 2. Post-tensioning operations including stressing, recording tendon elongations and gage pressures, and finishing tendons.

1.3 DEFINITIONS

- A. Strand Tail: Excess strand length extending past the anchorage device.
- B. Stressing Pocket: Void formed by pocket former at stressing-end anchorage to provide required cover over wedges and strand tail.
- C. Wedge Cavity: Cone-shaped hole in anchorage device designed to hold the wedges that anchor the strand.

1.4 COORDINATION

- A. Attachments and Penetrations:
 - 1. Attach permanent construction such as curtain-wall systems, handrails, fire-protection equipment, lights, and security devices to the post-tensioned slab using embedded anchors.
 - 2. Drilled anchors, power-driven fasteners, and core drilling for sleeves or other penetrations are not allowed unless authorized in writing by the Structural Engineer.
 - 3. Form penetrations within 18 inches of an anchorage with ASTM A 53/A 53M, Schedule 40 steel pipe.

1.5 PREINSTALLATION MEETINGS

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

1. Review methods and procedures related to installation and stressing of post-tensioning tendons including, but not limited to, the following:
 - a. Construction schedule and availability of materials, personnel, and equipment needed to make progress and avoid delays.
 - b. Storage of post-tensioning materials on-site.
 - c. Structural load limitations.
 - d. Coordination of post-tensioning installation drawings and nonprestressed reinforcing steel placing drawings.
 - e. Horizontal and vertical tolerances on tendons and nonprestressed reinforcement placement.
 - f. Marking and measuring of elongations.
 - g. Submittal of stressing records and requirements for tendon finishing.
 - h. Removal of formwork.

1.6 ACTION SUBMITTALS

A. Product Data: For the following:

1. Post-tensioning coating.
2. Tendon sheathing.
3. Anchorage devices.
4. Tendon couplers.
5. Bar and tendon supports.
6. Pocket formers.
7. Sheathing repair tape.
8. Stressing-pocket patching material.
9. Encapsulation system.

B. Shop Drawings: Include the following, prepared by or under the supervision of a qualified professional engineer, detailing tendon layout and installation procedures:

1. Installation drawings including plans, elevations, sections, and details.
2. Numbers, arrangement, and designation of post-tensioning tendons.
3. Tendon profiles and method of tendon support including chair heights and locations. Show tendon profiles at sufficient scale to clearly indicate all support points, with their associated heights.
4. Tendon anchorage details including bundled tendon flaring.
5. Tendon clearances around slab openings and penetrations.
6. Construction joint locations, pour sequence, locations of anchorages and blockouts required for stressing.
7. Stressing procedures and jacking force to result in final effective forces used in determining number of tendons required.
8. Calculated elongations for each tendon.
9. Details for horizontal curvature around openings and at anchorages.
10. Details for corners and other locations where tendon layouts may conflict with one another or nonprestressed reinforcing steel.
11. Locations of nonprestressed reinforcement required for installing post-tensioning tendons including, but not limited to, the following:
 - a. Support bars.
 - b. Backup bars and hairpins at anchorages.

- c. Hairpins at locations of horizontal curvature.
 - d. Supplemental reinforcement at blockouts.
- C. Samples: For the following products:
 - 1. Each anchorage device assembly with a minimum of 24 inches of coated, sheathed strand.
 - 2. Each coupler assembly with a minimum of 24 inches of coated, sheathed strand.
 - 3. Components of the encapsulation system, unassembled and clearly identified.
- D. Delegated-Design Submittal: For post-tensioning system.
 - 1. Sealed design calculations prepared by a qualified structural engineer indicating method of elongation calculation including values used for friction coefficients, anchorage seating loss, elastic shortening, creep, relaxation, and shrinkage.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer and testing agency. Include resume of individual supervising installation and stressing of post-tensioning tendons.
- B. Product Certificates:
 - 1. For each type of anchorage device and coupler.
 - 2. For each type of encapsulation system.
- C. Mill Test Reports: Certified mill test reports for prestressing strand used on Project indicating that strand is low relaxation and including the following:
 - 1. Coil numbers or identification.
 - 2. Breaking load.
 - 3. Load at 1 percent extension.
 - 4. Elongation at failure.
 - 5. Modulus of elasticity.
 - 6. Diameter and net area of strand.
- D. Field quality-control reports.
- E. Procedures Statement: Procedures for cutting excess strand tail and patching stressing pocket.
- F. Stressing Jack Calibration: Calibration certificates for jacks and gages to be used on Project. Calibrate each jack-and-gage set as a pair.
- G. Stressing Records: Submit the same day as stressing operations.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Fabricating plant certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."

- B. Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 - Field Fundamentals course or has equivalent verifiable experience and knowledge acceptable to the Structural Engineer.
 - 1. Superintendent must receive training from post-tensioning supplier in the operation of stressing equipment to be used on Project.
- C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
 - 1. Testing Agency Inspector: Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 1 - Field Fundamentals course or shall have equivalent verifiable experience and knowledge acceptable to the Structural Engineer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
- B. Immediately remove damaged components from Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain post-tensioning materials and equipment from single source.
 - 1. Stressing jacks not provided by post-tensioning supplier must be calibrated and approved for use on Project by post-tensioning supplier.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design post-tensioned reinforcement.
- B. Structural Performance: Design cast-in-place, post-tensioned concrete reinforcement as indicated in this Section. Show final effective forces, tendon profiles, and nonprestressed reinforcement on design installation drawings.
- C. Design structure to withstand the loads indicated according to governing codes, within limits and under conditions indicated.
- D. Comply with ACI 318 requirements unless more stringent requirements are indicated.
 - 1. Limits on stresses at transfer of prestress and under service load.
 - 2. Minimum bonded reinforcement.
 - 3. Concrete cover over reinforcement.

- E. Fire Resistance: Design members such that thickness and concrete cover over reinforcement comply with fire-resistance requirements of authorities having jurisdiction.
- F. Closure Strips: Locate closure strips at midspan and adjust tendon forces and profiles accordingly. Calculate moments in spans with closure strips assuming a continuous slab. Provide only nonprestressed reinforcement within closure strips. Design reinforcement in closure strip to carry ultimate moment at midspan.

2.3 PRESTRESSING TENDONS

- A. ACI Publications: Comply with ACI 423.6, "Specification for Unbonded Single Strand Tendons," unless otherwise indicated in the Contract Documents.
- B. Prestressing Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, seven-wire, low-relaxation, 0.5-inch diameter strand.
- C. Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties; chemically stable and nonreactive with prestressing steel, nonprestressed reinforcement, sheathing material, and concrete.
- D. Tendon Sheathing:
 - 1. Minimum Thickness: 0.050 inch for polyethylene or polypropylene with a minimum density of 0.034 lb/cu. in.
 - 2. Continuous over length of tendon to provide watertight encapsulation of strand and between anchorages to prevent intrusion of cement paste or loss of coating for a non-encapsulated system.
- E. Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements and capable of developing 95 percent of actual breaking strength of strand.
 - 1. Anchorage Bearing Stresses: Comply with ACI 423.6 for stresses at transfer load and service load.
 - 2. Fixed-End Anchorage Device Assemblies: Plant fabricated with wedges seated at a load of not less than 80 percent and not more than 85 percent of breaking strength of strand.
- F. Encapsulation System: Watertight encapsulation of prestressing strand consisting of the following:
 - 1. Wedge-Cavity Caps: Attached to anchorages with a positive mechanical connection and completely filled with post-tensioning coating.
 - a. Caps for Fixed- and Stressing-End Anchorage Devices: Designed to provide watertight encapsulation of wedge cavity. Sized to allow required extension of strand past the wedges.
 - 1) Attach cap for fixed-end anchorage device in fabricating plant.
 - b. Caps at Intermediate Anchorages: Open to allow passage of strand.

2. Sleeves: Attached to anchorage device with positive mechanical connection; overlapped a minimum of 4 inches with sheathing and completely filled with post-tensioning coating.

2.4 NONPRESTRESSED STEEL BARS

A. Support Bars, Reinforcing Bars, Hairpins:

1. Steel: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
2. Low-Alloy Steel: ASTM A 706/A 706M, deformed.

B. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening tendons and tendon support bars in place. Manufacture bar supports, according to CRSI's "Manual of Standard Practice," from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. For uncoated bars, use CRSI Class 1 plastic-protected bar supports.

2.5 ACCESSORIES

A. Pocket Formers: Capable of completely sealing wedge cavity; sized to provide the required cover over the anchorage and allow access for cutting strand tail.

B. Anchorage Fasteners: Galvanized-steel nails, wires, and screws used to attach anchorage devices to formwork.

C. Sheathing Repair Tape: Elastic, self-adhesive, moistureproof tape with minimum width of 2 inches, in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.

1. 3M
2. Adhesive Tape Products
3. Covalence Adhesives

2.6 PATCHING MATERIAL

A. One-component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead applications. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.

1. Euclid Chemical Company (The); Verticoat Supreme.
2. Fox Industries, Inc.; FX-228.
3. Kaufman Products, Inc.; Patchwell Kit HB.
4. Master Builders, Inc.; Emaco R350 Cl.
5. Sika Corporation, Inc.; SikaMonoTop 612.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Provide formwork for post-tensioned elements as specified Section 033000 "Cast-in-Place Concrete." Design formwork to support load redistribution that may occur during stressing operation. Ensure that formwork does not restrain elastic shortening, camber, or deflection resulting from application of prestressing force.
- B. Do not remove forms supporting post-tensioned elements until tendons have been fully stressed and elongations have been approved by the Structural Engineer.
- C. Do not place concrete in supported floors until tendons on supporting floors have been stressed and elongations have been approved by the Structural Engineer.

3.2 NONPRESTRESSED STEEL REINFORCEMENT PLACEMENT

- A. Placement of nonprestressed steel reinforcement is specified in Section 033000 "Cast-in-Place Concrete." Coordinate placement of nonprestressed steel reinforcement with installation of post-tensioning tendons.

3.3 TENDON INSTALLATION

- A. Install tendons according to installation drawings and procedures stated in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
 - 1. Tolerances: Comply with tolerances in ACI 423.6 for beams and slabs.
- B. Tendon Supports: Provide continuous slab bolsters or bars supported on individual high chairs spaced at a maximum of 42 inches o.c. to ensure tendons remain in their designated positions during construction operations and concrete placement.
 - 1. Support tendons as required to provide profiles shown on installation drawings. Position supports at high and low points and at intervals not exceeding 48 inches. Ensure that tendon profiles between high and low points are smooth parabolic curves.
 - 2. Attach tendons to supporting chairs and reinforcement without damaging tendon sheathing.
 - 3. Support slab tendons independent of beam reinforcement.
- C. Maintain tendon profile within maximum allowable deviations from design profile as follows:
 - 1. 1/4 inch for member depth less than or equal to 8 inches.
 - 2. 3/8 inch for member depth greater than 8 inches and less than or equal to 24 inches.
 - 3. 1/2 inch for member depth greater than 24 inches.

- D. Maintain minimum radius of curvature of 480-strand diameters for lateral deviations to avoid openings, ducts, and embedded items. Maintain a minimum of 2 inches of separation between tendons at locations of curvature.
- E. Limit tendon bundles to five tendons. Do not twist or entwine tendons within a bundle. Maintain a minimum distance of 12 inches between center of adjacent bundles.
- F. If tendon locations conflict with nonprestressed reinforcement or embedded items, tendon placement governs. Obtain the Structural Engineer's approval before relocating tendons or tendon anchorages that interfere with one another.
- G. Deviations in horizontal spacing and location of slab tendons are permitted when required to avoid openings and inserts.
- H. Installation of Anchorage Devices:
 - 1. Place anchorage devices at locations shown on approved installation drawings.
 - 2. Do not switch fixed- and stressing-end anchorage locations.
 - 3. Attach pocket formers, intermediate anchorage devices, and stressing-end anchorage devices securely to bulkhead forms. Install stressing-end and intermediate anchorage devices perpendicular to tendon axis.
 - 4. Install tendons straight, without vertical or horizontal curvature, for a minimum of 12 inches behind stressing-end and intermediate anchorages.
 - 5. Embed intermediate anchorage devices at construction joints in first concrete placed at joint.
 - 6. Minimum splice length in reinforcing bars at anchorages is 24 inches. Stagger splices a minimum of 60 inches.
 - 7. Place fixed-end anchorage devices in formwork at locations shown on installation drawings. Support anchorages firmly to avoid movement during concrete placement.
 - 8. Remove loose caps on fixed-end anchorages, refill with post-tensioning coating, and re-attach caps to achieve a watertight enclosure.
- I. Maintain minimum concrete cover as follows:
 - 1. From Exterior Edge of Concrete to Wedge Cavity: 1-1/2 inches.
 - 2. From Exterior Edge of Concrete to Strand Tail: 3/4 inch.
 - 3. From Exterior Edge of Concrete to Wedge-Cavity Cap: 1 inch.
 - 4. Top, Bottom, and Edge Cover for Anchorage Devices: 3/4 inch.
- J. Maintain minimum clearance of 6 between tendons and openings.
- K. Prior to concrete placement, mark tendon locations on formwork with spray paint.
- L. Do not install sleeves within 36 inches of anchorages after tendon layout has been inspected.
- M. Do not install conduit, pipe, or embeds requiring movement of tendons after tendon layout has been inspected.
- N. Do not use couplers unless location has been approved by the Structural Engineer.

3.4 SHEATHING INSPECTION AND REPAIR

- A. Inspect sheathing for damage after installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.
 - 1. Ensure that sheathing is watertight and there are no air voids.
 - 2. Follow tape repair procedures in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
- B. Maximum length of exposed strand behind anchorages is as follows:
 - 1. Fixed End: 12 inches .
 - 2. Intermediate and Stressing End: 1 inch.
 - a. Cover exposed strand with sheathing repair tape to prevent contact with concrete.
- C. Immediately remove and replace tendons that have damaged strand.

3.5 CONCRETE PLACEMENT

- A. Do not place concrete until placement of tendons and nonprestressed-steel reinforcement has been inspected by special inspector or testing agency.
- B. Provide Architect, Structural Engineer and special inspector or testing agency a minimum of 48 hours' notice before concrete placement.
- C. Place concrete as specified in Section 033000 "Cast-in-Place Concrete." Ensure compaction of concrete around anchorages.
- D. Ensure that position of tendon and nonprestressed-steel reinforcement does not change during concrete placement. Reposition tendons and nonprestressed-steel reinforcement moved during concrete placement to original location.
- E. Ensure that method of concrete placement does not damage tendon sheathing. Do not support pump lines, chutes, or other concrete-placing equipment on tendons.

3.6 TENDON STRESSING

- A. Calibrate stressing jacks and gages at start of project and at least every six months thereafter. Keep copies of calibration certificates for each jack-and-gage pair on Project site that are available for inspection. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.
- B. Stress tendons only under supervision of a qualified post-tensioning superintendent.
- C. Do not begin stressing operations until concrete strength has reached specified on structural drawings as indicated by compression tests of field-cured cylinders.
- D. Complete stressing within 96 hours of concrete placement.

- E. If concrete has not reached required strength, obtain the Structural Engineer's approval to partially stress tendons and delay final stressing until concrete has reached required strength.
- F. Stage stress transfer girders and foundation mats according to schedule shown on the Contract Drawings.
- G. If detensioning and restressing of tendon is required, discard wedges used in original stressing and provide new wedges.
- H. Mark and measure elongations according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons." Measure elongations to closest 1/8 inch.
- I. Submit stressing records within one day of completion of stressing. If discrepancies between measured and calculated elongations exceed plus or minus 7 percent, resolve these discrepancies to satisfaction of the Structural Engineer.
- J. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and calculated and measured elongations agree within 7 percent.
- K. If measured elongations deviate from calculated elongations by more than 7 percent, additional testing, restressing, strengthening, or replacing of affected elements may be required.
- L. Stressing Records: Testing agency shall record the following information during stressing operations:
 - 1. Name of Project.
 - 2. Date of approved installation drawings used for installation and stressing.
 - 3. Floor number and concrete placement area.
 - 4. Date of stressing operation.
 - 5. Weather conditions including temperature and rainfall.
 - 6. Name and signature of inspector.
 - 7. Name of individual in charge of stressing operation.
 - 8. Serial or identification numbers of jack and gage.
 - 9. Date of jack-and-gage calibration certificates.
 - 10. Gage pressure to achieve required stressing force per supplied calibration chart.
 - 11. Tendon identification mark.
 - 12. Calculated tendon elongation.
 - 13. Actual tendon elongation.
 - 14. Actual gage pressure.

3.7 TENDON FINISHING

- A. Do not cut strand tails or cover anchorages until stressing records have been reviewed and approved by the Structural Engineer.
- B. Cut strand tails as soon as possible after approval of elongations.

- C. Cut strand tail between 1/2 and 3/4 inch from wedges. Do not damage tendon or concrete during removal of strand tail. Acceptable methods of cutting strand tail include the following:
 - 1. Oxyacetylene flame.
 - 2. Abrasive wheel.
 - 3. Hydraulic shears.
 - 4. Plasma cutting.
- D. Install caps and sleeves on intermediate anchorages within one day of stressing.
- E. Cut strand tails and install caps on stressing-end anchorages within one day of the Structural Engineer's acceptance of elongations.
- F. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of pocket to remove laitance or post-tensioning coating before installing patch material. Finish patch material flush with adjacent concrete.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Before concrete placement, special inspector or testing agency will inspect the following for compliance with post-tensioning installation drawings and the Contract Documents:
 - a. Location and number of tendons.
 - b. Tendon profiles and cover.
 - c. Installation of backup bars, hairpins, and other nonprestressed reinforcement shown on post-tensioning installation drawings.
 - d. Installation of pocket formers and anchorage devices.
 - e. Repair of damaged sheathing.
 - f. Connections between sheathing and anchorage devices.
 - 2. Special inspector or testing agency will record tendon elongations during stressing.
 - 3. Special inspector or testing agency will immediately report deviations from the Contract Documents to the Structural Engineer.
- B. Prepare test and inspection reports.

3.9 PROTECTION

- A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade components.
- B. Protect exposed components within one workday of their exposure during installation.
- C. Prevent water from entering tendons during installation and stressing.

- D. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

3.10 REPAIRS

- A. Submit repair procedure to the Structural Engineer for evaluation and approval.
- B. Do not proceed with repairs requiring removal of concrete unless authorized in writing by the Structural Engineer.

END OF SECTION 03381 6

SECTION 03410 - PRECAST STRUCTURAL CONCRETE

PART 1- GENERAL

1.1 SUMMARY

- A. Section includes precast structural concrete.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design precast structural concrete, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.
 - 1. Fire-Resistance Rating: Select material and minimum thicknesses to provide indicated fire rating.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each precast concrete mixture.
- C. Shop Drawings: Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement. Detail fabrication and installation of precast structural concrete units.
- D. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Qualification Data: For installed and fabricator.
- F. Welding certificates.
- G. Material certificates.
- H. Material test reports.
- I. Source quality-control reports.
- J. Field quality-control and special inspection reports.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 1. Participates in PCI's Plant Certification program at time of bidding and is designated a PCI-certified plant as follows: Retain subparagraph below and appropriate option if Group C products are required.
 - a. Category C1 – Precast Concrete Products – no prestressed reinforcement
 - b. Category C2 – Prestressed Hollowcore and Repetitively Produced Products
 - c. Category C3 – Prestressed Straight Strand Structural Members
 - d. Category C4 – Prestressed Deflected Strand Structural Members
- B. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations in PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.
- C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D.1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- E. Fire-Resistance Calculations: Where indicated, provide precast structural concrete units whose fire resistance meets the prescriptive requirements of authorities having jurisdiction or has been calculated according to ACI 216.1/TMS 0216.1, "Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies," PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," and is acceptable to authorities having jurisdiction.
- F. Preinstallation Conference: Conduct conference at Project Site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Support units during shipment on non-staining shock-absorbing material in same position as during storage.
- B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- C. Lift and support units only at designated points shown on Shop Drawings.

1.6 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.2 PRESTRESSING TENDONS

- A. Strand: ASTM A 416/A 416M, Grade 270, uncoated, 7-wire, low-relaxation strand.
 - 1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.6 and sheath with polypropylene tendon sheathing complying with ACI 423.6. Include anchorage devices and coupler assemblies.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.
- B. Supplementary Cementitious Materials:
 - 1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
 - 2. Metakaolin Admixture: ASTM C 618, Class N.
 - 3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.4 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.
- C. Carbon-Steel Plate: ASTM A 283/A 283M.
- D. Malleable-Iron Castings: ASTM A 47/A 47M.
- E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30.
- F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
- G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
- H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65.
- I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.
- J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.
- K. High-Strength Bolts and Nuts: ASTM A 325 or ASTM A 490, Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563; and hardened carbon-steel washers, ASTM F 436.
 - 1. Do not zinc coat ASTM A 490 bolts.
- L. Zinc-Coated Finish: For exterior steel items steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.
- M. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79.

2.5 BEARING PADS

- A. Provide bearing pads for precast structural concrete units as recommended by precast fabricator for application.

2.6 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.
- C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
 - 1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
 - 2. Limit use of fly ash to 20 percent replacement of portland cement by weight and granulated blast-furnace slag to 20 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested according to ASTM C 1218/C 1218M.
- D. Normal-Weight Concrete Mixtures: Proportion by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi minimum.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 116.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

- G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.8 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 - 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
- F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses.
- G. Pre-stress tendons for precast structural concrete units by either pre-tensioning or post-tensioning methods. Comply with PCI MNL 116.
- H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.
- J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 116.
- K. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- L. Comply with PCI MNL 116 procedures for hot-weather concrete placement.

- M. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that will not show in finished structure.
- N. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- O. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.9 FABRICATION TOLERANCES

- A. Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product dimension tolerances.

2.10 COMMERCIAL FINISHES

- A. Commercial Grade: Remove fins and large protrusions and fill large holes. Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks, and color variations are permitted. Limit form joint offsets to 3/16 inch.
- B. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch in width that occur more than once per 2 sq. in. Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch.
- C. Grade B Finish: Fill air pockets and holes larger than 1/4 inch in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch in width that occur more than once per 2 sq. in. Grind smooth form offsets or fins larger than 1/8 inch. Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.
- D. Grade A Finish: Fill surface blemishes with the exception of air holes 1/16 inch in width or smaller, and form marks where the surface deviation is less than 1/16 inch. Float apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles. Discoloration at form joints is permitted. Grind smooth all form joints.
- E. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.

- F. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.
- G. Apply roughened surface finish according to ACI 318 to precast concrete units that will receive concrete topping after installation.

2.11 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements.
- B. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Engineer's approval.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.
- B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, supports, and bracing as required to maintain position, stability, and alignment of units until permanent connection.
 - 1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 2. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
 - 3. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.
- C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
- D. Field cutting of precast units is not permitted without approval of the Engineer.
- E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.
- F. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
- G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

- H. Grouting: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled.

3.2 ERECTION TOLERANCES

- A. Erect precast structural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.
- B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Engineer.

3.3 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Erection of precast structural concrete members.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Field welds will be visually inspected and nondestructive tested according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Engineer.
- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- G. Prepare test and inspection reports.

3.4 REPAIRS

- A. Repair precast structural concrete units if permitted by Engineer.
 - 1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units has not been impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by the Structural Engineer.

3.5 CLEANING

- A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034100

SECTION 03541 - GYPSUM UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes gypsum-cement-based, self-leveling underlayment for application below interior floor coverings.
- B. Related Sections:
 - 1. Division 9 Sections for patching and leveling compounds applied with floor coverings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
- C. Qualification Data: For qualified Installer.
- D. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.
- E. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.
- B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.
- C. Fire-Resistance Ratings: Where indicated, provide gypsum-cement underlayment systems identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- D. Sound Transmission Characteristics: Where indicated, provide gypsum-cement underlayment systems identical to those of assemblies tested for STC and IIC ratings per ASTM E 90 and ASTM E 492 by a qualified testing agency.
- E. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
 1. Place gypsum-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

1.7 COORDINATION

- A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, specified in Division 9 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 GYPSUM-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Gypsum-cement-based, self-leveling product that can be applied in minimum uniform thickness of 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Maxxon Corporation; Gyp-Crete.
 - b. Or equal Levelrock product by USG Corporation;
 - c. Or equal product by Ardex.
 2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.
 3. Compressive Strength: Not less than 2000 psi (13.8 MPa) at 28 days when tested according to ASTM C 109/C 109M.
 4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

- B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.
 - 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).
- D. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.
- E. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

2.2 ACCESSORIES

- A. Sound Mat:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Maxxon Corporation; Acoustimat II.
 - b. USG Corporation; Levelrock Brand Sound Reduction Mat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance.
 - 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
 - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
 - 1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m) in 24 hours.

- C. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
 - 1. Install underlayment reinforcement recommended in writing by manufacturer.
- D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.
- E. Sound Control Mat: Install sound control materials according to manufacturer's written instructions.
 - 1. Do not install mechanical fasteners that penetrate through the sound control materials.

3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
 - 1. Apply a final layer without aggregate to product surface.
 - 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03541

SECTION 04700 - ARCHITECTURAL STONE VENEER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Architectural simulated stone veneer and trim.

1.2 REFERENCES

- A. American National Standards Institute (ANSI): ANSI A1 18.4 Specifications for Latex-Portland Cement Mortar.
- B. American Society for Testing and Materials (ASTM):
 1. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 2. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
 3. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
 4. ASTM C 177 - Standard Test Method for Steady-State Head Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 5. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
 6. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
 7. ASTM C 482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
 8. ASTM C 567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.
 9. ASTM C 847 - Standard Specification for Metal Lath.
 10. ASTM C 932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
 11. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.
 12. ASTM C 1032 - Standard Specification for Woven Wire Plaster Base.
 13. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
 14. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- C. International Code Council (ICC):
 1. ICC Evaluation Service - Evaluation Report AC51- Acceptance Criteria for Precast Stone Veneers.
 2. ICC Evaluation Service - Evaluation Report ESR-1215 - Eldorado Stone, Eldorado Brick and Eldorado Adobe Veneers and Eldorado Accents.
- D. Underwriter's Laboratory (UL): Building Materials Directory.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Product Data: Masonry Veneer Manufacturers Association (MVMA) see masonryveneer.org:

1. Preparation instructions.
 2. Storage and handling requirements.
 3. Installation methods.
- C. Selection Samples: Standard sample board consisting of small-scale pieces of veneer units showing full range of textures and colors.
- D. Verification Samples: Following initial sample selection submit "laid-up" sample board using the selected stone and mortar materials and showing the full range of colors expected in the finished Work; minimum sample size: 3 feet by 3 feet (1 m by 1 m).
- E. Quality Assurance/Control Submittals:
1. Qualifications:
 - a. Proof of manufacturer qualifications.
 - b. Proof of installer qualifications.
 2. Regulatory Requirements: Evaluation reports.
 3. Installation instructions for related materials.
- F. Closeout Submittals: Reference Section 01780 - Closeout Submittals; submit following items:
1. Maintenance Instructions.
 2. Special Warranties.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced mason familiar with installation procedures for manufactured veneer.
- B. Product Certifications:
1. ICC Evaluation Service - Evaluation Report ESR-1215.
- C. Mock-Up: Provide a mock-up for evaluation of final appearance.
1. Prepare 8 foot by 8 foot sample at a location on the structure as selected by the Architect. Use approved selection sample materials and colors.
 2. Obtain Architect's approval.
 3. Protect and retain sample as a basis for approval of completed manufactured stone work.
 4. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 5. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction..

1.6 PROJECT CONDITIONS

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

1.7 WARRANTY

- A. Manufacturer warrants wall veneers for a period of fifty years against manufacturing defects when used on structures conforming to local building codes and when installed in accordance with manufacturer's written instructions.
 - 1. Warranty coverage specifically excludes damage resulting from wall movement, settlement of the building, contact with chemicals or paint, discoloration due to contaminants, staining or oxidation.
 - 2. Warranty coverage is limited to replacement or repair of defective materials only and does cover labor to remove or replace materials. Warranty coverage is limited to the original purchaser.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Eldorado Stone, LLC; 1370 Grand Ave., Bldg B, San Marcos, CA 92078. ASD. Toll Free Tel: (800) 925-1491. Tel: (760) 736-3232. Fax: (760) 736-8890. Email: customerservice@eldoradostone. Web: <http://www.eldoradostone.com>.
- B. Or prior approved product.

2.2 STONE VENEER:

- A. Veneer Unit Properties: Precast stone veneer units and accent pieces consisting of Portland cement, lightweight aggregates, and mineral oxide pigments.
 - 1. Compressive Strength: ASTM C 192 and ASTM C 39, 5 sample average: greater than 1,800 psi (12.4MPa).
 - 2. Shear Bond: ASTM C 482: 50 psi (345kPa).
 - 3. Water Absorption: ICC Evaluation Service AC 51 (Section 4.6 and Table 2): Less than 22 percent when density is less than 85 PCF; less than 18 percent when density is less than 105 PCF.
 - 4. Freeze-Thaw Test: ASTM C 67: Less than 3 percent weight loss and no disintegration.
 - 5. Thermal Resistance: ASTM C 177: 0.473 at 1.387 inches (35 mm) thick.
- B. Units:
 - 1. Profile: Ashlar, include matching corner pieces.
 - a. Accent Color: Santa Barbara.

2.3 RELATED MATERIALS

- A. Weather Resistive Barrier: Two layers as specified in other sections.
- B. Reinforcing: Complying with code agency requirements for the type of substrate over which stone veneer is installed.
 - 1. ASTM C 847, 2.5lb/yd² (1.4kg/m²) galvanized expanded metal lath.
- C. Mortar:
 - 1. Pre-Packaged Latex-Portland Cement Mortar: ANSI A118.4.
- D. Bonding Agent:
 - 1. Exterior integral bonding agent meeting ASTM C 932.
 - 2. Exterior integral bonding agent meeting ASTM C 1059 Type II.
- E. Sealer:

1. Water based silane or siloxane masonry sealer, clear.

2.4 MORTAR

- A. Jointless/Dry-Stacked Installation:
 1. Mix mortar in accordance with Manufacturer's "Suggested Mix" mortar preparation instructions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Examine substrates upon which work will be installed.
- C. Commencement of work by installer is acceptance of substrate.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Protection: Protect adjacent work from contact with mortar.
- B. Clean surfaces thoroughly prior to 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. Install and clean stone in accordance with Standard Installation Grouted Joint.
- C. Install and clean stone in accordance with Jointless/Dry-Stacked.
- D. Apply sealer in accordance with sealer manufacturer's installation instructions.

3.4 PROTECTION

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

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Manufacturer's Field Service Representative shall make periodic site visits for installation consultation and inspection as requested by Owner.

3.6 CLEANING

- A. Remove protective coverings from adjacent work.
- B. Cleaning Veneer Units:
 1. Wash with soft bristle brush and water/granulated detergent solution.

2. Rinse immediately with clean water.
- C. Removing Efflorescence:
1. Allow veneer to dry thoroughly.
 2. Scrub with soft bristle brush and clean water.
 3. Rinse immediately with clean water; allow to dry.
 4. If efflorescence is still visible, repeat above procedure using a solution of 1 part household vinegar and 5 parts water.
 5. Rinse immediately with clean water.

END OF SECTION

SECTION 04810 – CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

B. Related Sections:

1. Section 03300 "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength.
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
5. Prism Test: For each type of construction required, according to ASTM C 1314.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

1.7 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.

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

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches.
 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 3. Protect approved sample panels from the elements with weather-resistant membrane.
 4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

- a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings.
 2. Build mockups for typical exterior and interior walls in sizes approximately 48 inches, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 3. Protect accepted mockups from the elements with weather-resistant membrane.
 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119,

by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- C. Integral Water Repellent: Provide units made with integral water repellent where indicated.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ACM Chemistries, Inc.; RainBloc.
 - 2) BASF Aktiengesellschaft; Rheapel Plus.
 - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
- D. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of as indicated on the drawings.
 - 2. Density Classification: As indicated on the drawings.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 - 4. Size (Width): Manufactured to the following dimensions: As indicated on the drawings.
 - 5. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
 - 6. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.3 CONCRETE AND MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C 91.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capital Materials Corporation; Flamingo Color Masonry Cement.
 - b. Cemex S.A.B. de C.V.; [Brikset Type N] [Citadel Type S] [Dixie Type S] [Kosmortar Type N] [Richmortar] [Victor Plastic Cement].
 - c. Essroc, Italcementi Group; Brixment or Velvet.
 - d. Holcim (US) Inc.; [Mortamix Masonry Cement] [Rainbow Mortamix Custom Buff Masonry Cement] [White Mortamix Masonry Cement].
 - e. Lafarge North America Inc.; Magnolia Masonry Cement, Lafarge Masonry Cement, Trinity White Masonry Cement.
 - f. Lehigh Cement Company; Lehigh Masonry Cement, Lehigh White Masonry Cement.
 - g. National Cement Company, Inc.; Coosa Masonry Cement.
- F. Mortar Cement: ASTM C 1329.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.

G. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C 404.

- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

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

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACM Chemistries, Inc.; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

K. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.

5. Wire Size for Veneer Ties: 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet , with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with STM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
3. Stainless-Steel Wire: ASTM A 580/A 580M.
4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
6. Stainless-Steel Sheet: ASTM A 666.
7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
8. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.

B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch-thick, steel sheet, galvanized after fabrication, 0.105-inch-thick, steel sheet, galvanized after fabrication. Note that the MSJC Code does not allow ties made from galvanized steel sheet for interior use in spaces where humidity exceeds 75 percent.
 - a. 0.064-inch or 0.108-inch-thick, galvanized sheet may be used at interior walls unless otherwise indicated.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch-diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
3. Corrugated Metal Ties: As indicated.

C. Partition Top anchors: 0.105-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.7 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- D. Post-installed Anchors: Torque-controlled expansion anchors.
 1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
 3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) Group 2 (A4) stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.8 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim" and as follows:
 1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
 2. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216 inch thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
 3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
 4. Fabricate through-wall metal flashing embedded in masonry from stainless steel copper, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
 - 2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
 - 3) Sandell Manufacturing Co., Inc.; Mechanically Keyed Flashing.
 5. Fabricate through-wall flashing with snap-lock receiver on exterior face where indicated to receive counter flashing.

6. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 7. Fabricate through-wall flashing with sealant stop where indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
 8. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
 9. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 10. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
 11. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.
- B. Flexible Flashing: Use one of the following unless otherwise indicated:
1. Copper-Laminated Flashing: 5-oz./sq. ft. or 7-oz./sq. ft. copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.; [Copper Fabric Flashing] [Copper Sealtite 2000].
 - 2) Dayton Superior Corporation, Dur-O-Wal Division; Copper Fabric Thru-Wall Flashing.
 - 3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
 - 5) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 6) York Manufacturing, Inc.; Multi-Flash 500.
 2. Asphalt-Coated Copper Flashing: 5-oz./sq. ft. or 7-oz./sq. ft. copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.; Cop-R-Cote.
 - 2) Dayton Superior Corporation, Dur-O-Wal Division; Copper Coated Thru-Wall Flashing.
 - 3) Hohmann & Barnard, Inc.; H & B C-Coat Flashing.
 - 4) Phoenix Building Products; Type ACC-Asphalt Bituminous Coated.
 - 5) Sandell Manufacturing Co., Inc.; Coated Copper Flashing.

3. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch or 0.040 inch.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.; Peel-N-Seal.
 - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
 - 4) Fiberweb, Clark Hammerbeam Corp.; Aquafash 500.
 - 5) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 6) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 7) Hohmann & Barnard, Inc.; Textroflash.
 - 8) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - 9) Polyguard Products, Inc.; [Polyguard 300] [Polyguard 400].
 - 10) Sandell Manufacturing Co., Inc.; Sando-Seal.
 - 11) Williams Products, Inc.; Everlastic MF-40.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
4. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) DuPont; Thru-Wall Flashing.
 - 2) Hohmann & Barnard, Inc.; Flex-Flash.
 - 3) Hyload, Inc.; Hyload Cloaked Flashing System.
 - 4) Mortar Net USA, Ltd.; Total Flash.
 - b. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
 - c. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch-thick coating of adhesive.
 - d. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch-thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
 - 1) Color: As indicated.
 - e. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

5. EPDM Flashing: Sheet flashing product made from ethylene-propylene-dieneterpolymer, complying with ASTM D 4637, 0.040 inch thick.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
 - 2) Firestone Specialty Products; FlashGuard.
 - 3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
 - 4) Hohmann & Barnard, Inc.; Epra-Max EPDM Thru-Wall Flashing.
 - 5) Sandell Manufacturing Co., Inc.; EPDM Flashing.
- C. Application: Unless otherwise indicated, use the following:
 1. Where flashing is indicated to receive counter flashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge or elastomeric thermoplastic flashing with drip edge or flexible flashing with a metal sealant stop.
 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Mortar Net USA, Ltd.; Blok-Flash.
- E. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
 1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
 3. Elastomeric Sealant: ASTM C 920, chemically curing urethane, polysulfide, silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.10 MORTAR AND GROUT MIXES

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

3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 4. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 3. Provide grout with a slump as indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:

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

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do

not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.8 LINTELS

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

3.9 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.11 REPAIRING, POINTING, AND CLEANING

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

3.12 MASONRY WASTE DISPOSAL

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

END OF SECTION 042200

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Reinforcing steel.
 - 4. Masonry joint reinforcement.
 - 5. Ties and anchors.
 - 6. Embedded flashing.

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Samples for Verification: For the following:
 - 1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
 - 2. Accessories embedded in the masonry.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- D. Mockups: Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.

2. Build mockups for the following types of masonry, including face and backup wythes and accessories. Exterior wall mock up shall be complete mockup showing entire wall system (i.e. masonry ties, water proofing, and insulation board) and shall be 12' long by 12' high. Mockup shall also include the aluminum window system and sealant joints. Other requirements of mockups include:
 - a. Typical exterior wall shall include decorative concrete units and face brick.
 - b. Typical exterior wall with through-wall flashing installed for length of mockup.
 - c. Typical interior unit masonry wall.
3. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
5. Approved mockups of interior wall can be used in final construction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
 2. Where one wythe of multi-wythe masonry walls is complete in advance of other wythe, secure cover a minimum of 24 " down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
1. Weight Classification: Light weight , unless otherwise indicated
 2. Provide Type II, nonmoisture-controlled units.
 3. Size (Width): Manufactured to the following dimensions:
 - a. 8 inches (203 mm) nominal; 7-5/8 inches (194 mm) actual.
 4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.2 BRICK

- A. General: Provide shapes indicated and as follows for each form of brick required:
1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
- B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D. Mortar Cement: ASTM C 1329.
- E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

- F. Aggregate for Grout: ASTM C 404.
- G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- H. Water: Potable.
- I. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Mortar Cement:
 - a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
 - b. Lafarge Mortar Cement; Lafarge Corporation.
 - 2. Water-Repellent Admixture:
 - a. Mortar Tite; Addiment Inc.
 - b. Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division.
 - c. Rheopel; Master Builders.

2.4 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).

2.5 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
 - 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
 - 2. Wire Size for Side Rods: W2.8 or 0.188-inch (4.8-mm) diameter.
 - 3. Wire Size for Cross Rods: W2.8 or 0.188-inch (4.8-mm) diameter.
 - 4. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide either ladder type with single pair of side rods and cross rods spaced not more than 8 inches o.c.

2.6 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.

2.7 EMBEDDED FLASHING MATERIALS

- A. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
 - 1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 5-oz./sq. ft. (1.5-kg/sq. m) sheet copper bonded with asphalt

- between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
2. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of 5-oz./sq. ft. (1.5-kg/sq. m) sheet copper coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- C. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
1. Copper-Laminated Flashing:
 - a. Copper Fabric; AFCO Products, Inc.
 - b. H & B C-Fab Flashing; Hohmann & Barnard, Inc.
 - c. Copper Fabric Flashing; Polytite Manufacturing Corp.
 - d. York Copper Fabric Flashing; York Manufacturing, Inc.
 2. Asphalt-Coated Copper Flashing:
 - a. Cop-A-Cote; AFCO Products, Inc.
 - b. H & B C-Coat Flashing; Hohmann & Barnard, Inc.
 - c. Coated Copper Flashing; Polytite Manufacturing Corp.
 - d. Copperseal; York Manufacturing, Inc.

2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.
1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
 2. For reinforced masonry and where indicated, use Type S.
 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- C. Grout for Unit Masonry: Comply with [ASTM C 476].
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
1. Verify that foundations are within tolerances specified.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

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

F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns,

and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joints in each course centered on units in course above and below, unless otherwise noted.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of roof structure above. At metal deck roof structure, utilize one of the following:
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on

exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 8 inches o.c. At multi-wythe walls, alternate ladder type reinforcing and two piece reinforcing.
 2. In addition to continuous reinforcement, provide reinforcement not more than 8" above and below wall openings and extending 12" beyond openings.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

- A. *General: Install control and expansion joints in unit masonry where indicated, but not more than 30 feet on center. In addition, provide control joints in concrete masonry where concrete masonry walls bypass adjacent structural steel columns. Coordinate the location of control/expansion joints with Architect prior to beginning masonry installation. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.*
- B. Form control joints in concrete masonry as follows:
1. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete. Form open joint of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants."
- C. Form control/expansion joints in brick made from clay or shale as indicated on exterior elevations (maximum 30 feet on center) and as follows:
1. Form open joint of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.
- D. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.8 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.
- C. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels. Refer to structural drawings for additional information.
1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout.

Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

3.9 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

3.10 REINFORCED UNIT MASONRY INSTALLATION

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

3.11 FIELD QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.
 - 1. Payment for these services will be made by Owner.
 - 2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Mortar properties will be tested per [ASTM C 780].
- C. Grout will be sampled and tested for compressive strength per [ASTM C 1019].

3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.
 4. Properly and legally dispose of all waste.

END OF SECTION 04810

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Framing with engineered wood products.
 - 3. Shear wall panels.
 - 4. Rooftop equipment bases and support curbs.
 - 5. Wood blocking, cants, and nailers.
 - 6. Wood furring and grounds.
 - 7. Wood sleepers.
 - 8. Utility shelving.
 - 9. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 06160 "Sheathing."

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Engineered wood products.
 - 4. Shear panels.
 - 5. Power-driven fasteners.
 - 6. Powder-actuated fasteners.
 - 7. Expansion anchors.
 - 8. Metal framing anchors.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 2. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
- C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on the Drawings and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: As indicated on the structural drawings.

1. Application: Refer to structural drawings.
 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Mixed southern pine; SPIB.
 - c. Spruce-pine-fir; NLGA.
 - d. Hem-fir; WCLIB, or WWPA.
 - e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - f. Northern species; NLGA.
 - g. Eastern softwoods; NeLMA.
 - h. Western woods; WCLIB or WWPA.
- B. Load-Bearing Partitions: As indicated on the structural drawings.
1. Application: Refer to structural drawings.
 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWPA.
 - d. Mixed southern pine; SPIB.
 - e. Spruce-pine-fir; NLGA.
 - f. Douglas fir-south; WWPA.
 - g. Hem-fir; WCLIB or WWPA.
 - h. Douglas fir-larch (north); NLGA.
 - i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. Framing other than non-load bearing and load bearing partitions refer to the structural drawings.
- ## 2.4 ENGINEERED WOOD PRODUCTS
- A. Engineered Wood Products, General: Products shall contain no urea formaldehyde.
- B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boise Cascade Corporation.
 - b. Finforest USA.
 - c. Georgia-Pacific.
 - d. Jager Building Systems Inc.
 - e. Louisiana-Pacific Corporation.
 - f. Pacific Woodtech Corporation.
 - g. Roseburg Forest Products Co.
 - h. Standard Structures Inc.
 - i. Stark Truss Company, Inc.

- j. West Fraser Timber Co., Ltd.
- k. Weyerhaeuser Company.

- C. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.
 - 1. Manufacturer: Provide products by same manufacturer as I-joists.
 - 2. Material: All-veneer product glued-laminated wood or product made from any combination solid lumber, wood strands, and veneers.
 - 3. Thickness: 1-1/8 inches
 - 4. Refer to structural drawings for additional information.

2.5 SHEAR WALL PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Shear Transfer Systems.
 - 2. Simpson Strong-Tie Co., Inc.
 - 3. Weyerhaeuser Company.

- B. Wood-Framed Shear Wall Panels: Prefabricated assembly consisting of wood perimeter framing, tie downs, and Exposure I, Structural I plywood or OSB sheathing.
 - 1. Products shall contain no urea formaldehyde.

2.6 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
 - 7. Utility shelving.

- B. For items of dimension lumber size, refer to the structural drawings.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

- B. Nails, Brads, and Staples: ASTM F 1667.

- C. Power-Driven Fasteners: NES NER-272.

- D. Wood Screws: ASME B18.6.1.
- E. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Cleveland Steel Specialty Co.
 - 2. KC Metals Products, Inc.
 - 3. Phoenix Metal Products, Inc.
 - 4. Simpson Strong-Tie Co., Inc.
 - 5. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.9 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.
- E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

- G. Do not splice structural members between supports unless otherwise indicated.
- H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- K. Use steel common nails unless otherwise indicated.

3.2 PROTECTION

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

END OF SECTION 061000

SECTION 06202 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior trim, including non-fire-rated interior door frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and the following grading rules:
 1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
 2. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
 3. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
 4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
 5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
 6. WWPAA: Western Wood Products Association, "Western Lumber Grading Rules."
- B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 1. For exposed lumber, mark grade stamp on end or back of each piece.
- C. Softwood Plywood: DOC PS 1.
- D. Hardboard: AHA A135.4.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.
 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.
 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
 4. Do not use material that is warped or does not comply with requirements for untreated material.
 5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

2.3 INTERIOR TRIM

A. Lumber Trim for Opaque Finish (Painted Finish):

Species and Grade: Douglas fir-larch or Douglas fir south, Superior or C & Btr finish; NLGA, WCLIB, or WWPA..

1. Maximum Moisture Content: 9 percent.
2. Finger Jointing: Allowed.
3. Face Surface: Surfaced (smooth).

B. Moldings for Opaque Finish (Painted Finish): Made to patterns included in WMMPA WM 12.

1. Softwood Moldings: WMMPA WM 4, P grade.
 - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
 - b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
2. Finger Jointing: Allowed.
3. Profiles and dimensions: See drawing for trim profiles and dimensions.

2.4 SHELVING AND CLOTHES RODS

A. Closet/Utility Shelving: Made from the following material, 3/4 inch (19 mm) thick.

1. Softwood Boards: Douglas fir-larch, Douglas fir south, or hem-fir; Superior or C & Btr finish; NLGA, WCLIB, or WWPA; or southern pine, C finish; SPIB; kiln dried.

B. Shelf Cleats: 3/4-by-3-1/2-inch (19-by-89-mm) boards, as specified above for lumber trim for opaque finish.

C. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.

D. Shelf Brackets without Rod Support: BHMA A156.16, B04041; prime-painted formed steel.

E. Clothes Rods: 1-5/16-inch- (33-mm-) diameter, aluminum tubes.

F. Rod Flanges: Aluminum.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.6 FABRICATION

- A. Back out or kerf backs of the following members except those with ends exposed in finished work:
 - 1. Interior standing and running trim except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.

4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 1. Install trim after gypsum-board joint finishing operations are completed.
 2. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 SHELVING AND CLOTHES ROD INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2 inch (13 mm) less than width of shelves and sand exposed ends smooth.
- B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches (400 mm) o.c. Use 2 fasteners at each framing member or fastener location for cleats 4 inches nominal (89 mm actual) in width and wider.
 1. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing. Remove adhesive that is squeezed out after fastening shelf cleats in place.
- C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches (800 mm) o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- D. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches (300 mm) o.c.
- E. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches (900 mm) o.c. and within 6 inches (150 mm) of end of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- F. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
 1. Fasten shelves to cleats with finish nails or trim screws, set flush.

2. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.

- G. Install rod flanges for rods as indicated. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.

3.6 ADJUSTING

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

3.7 CLEANING

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

3.8 PROTECTION

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

END OF SECTION 06202

SECTION 06415 - STONE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes stone countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
 - 1. Show locations and details of joints.
 - 2. Show direction of veining, grain, or other directional pattern.
- C. Samples for Verification:
 - 1. For each stone type indicated, in sets of Samples not less than 12 inches (300 mm) square. Include two or more Samples in each set and show the full range of variations in appearance characteristics expected in completed Work.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stone countertops to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate stone countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of stone countertops.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
 - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 - 2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain stone, from a single quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
 - 2. Make stone slabs available for examination by Architect.
 - a. Architect will select aesthetically acceptable slabs and will indicate aesthetically unacceptable portions of slabs.
 - b. Segregate slabs selected for use on Project and mark backs indicating approval.
 - c. Mark and photograph aesthetically unacceptable portions of slabs as directed by Architect.

2.2 GRANITE (ST-1 as indicated on drawings)

- A. Granite: Comply with ASTM C 615.
- B. Description: Uniform, fine-grained stone.
- C. Varieties and Sources: Subject to compliance with requirements, provide one of the following:
 - 1. Daltille – Kashmir White G296 from India or prior approved equal.
- D. Cut stone from contiguous, matched slabs in which natural markings occur.

- E. Finish: Polished

2.3 ADHESIVES, GROUT, SEALANTS, AND STONE ACCESSORIES

- A. General: Use only adhesives formulated for stone and ceramic tile and that are recommended by their manufacturer for the application indicated.
- B. Water-Cleanable Epoxy Adhesive: ANSI A118.3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Bostik, Inc.
 - b. C-Cure.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Summitville Tiles, Inc.
- C. Stone Adhesive: Two-part epoxy adhesive, formulated specifically for bonding stone to stone, with an initial set time of not more than two hours at 70 deg F (21 deg C).
 - 1. Color: Match stone.
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Epoxy Adhesive:
 - 1) Akemi North America; Akepox.
 - 2) Axson North America, Inc; Akabond Epoxy.
 - 3) Bonstone Materials Corporation; Touchstone Last Patch.
- D. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 07920 "Joint Sealants" and will not stain the stone it is applied to.
 - 1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
 - 2. Joint Sealant: Single component, nonsag, neutral curing, silicone; Class 25.
 - 3. Color: As selected by Architect from manufacturer's full range.
- E. Stone Cleaner: Specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer and, if a sealer is specified, by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- F. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Bostik, Inc.
- b. Custom Building Products.
- c. Hillyard, Inc.
- d. HMK Stone Care System.
- e. Miracle Sealants Company.
- f. Stone Care International Inc.
- g. Summitville Tiles, Inc.

2.4 STONE FABRICATION, GENERAL

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
 1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.
- B. Grade and mark stone for final locations to produce assembled countertop units with an overall uniform appearance.
- C. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated.
 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
 2. Clean sawed backs of stones to remove rust stains and iron particles.
 3. Dress joints straight and at right angle to face unless otherwise indicated.
 4. Cut and drill sinkages and holes in stone for anchors, supports, and attachments.
 5. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
 6. Fabricate molded edges with machines having abrasive shaping wheels made to reverse contour of edge profile to produce uniform shape throughout entire length of edge and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units. Form corners of molded edges as indicated with outside corners slightly eased unless otherwise indicated.
 7. Finish exposed faces of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.
- D. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

2.5 STONE COUNTERTOPS

- A. General: Comply with recommendations in MIA's "Dimension Stone - Design Manual VI."
- B. Nominal Thickness: Provide thickness indicated, but not less than 3/4 inch (20 mm). Gage backs to provide units of identical thickness.
- C. Edge Detail: Straight, slightly eased at top.

- D. Splashes: Provide 3/4-inch- (20-mm-) thick backsplashes and end splashes unless otherwise indicated.
 - 1. Height: 4 inches (100 mm), unless otherwise indicated.
 - 2. Top-Edge Detail: Straight, slightly eased at corner.
- E. Joints: Fabricate countertops without joints.
- F. Joints: Fabricate countertops in sections for joining in field, with joints. Coordinate joint location with Architect during shop drawing process. Joint shall be sized as follows:
 - 1. Bonded Joints: 1/32 inch (0.8 mm) or less in width.
- G. Cutouts and Holes:
 - 1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
 - 2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive stone countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone countertops.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone countertops.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Advise installers of other work about specific requirements for placement of inserts and similar items to be used by stone countertop Installer for anchoring stone countertops. Furnish installers of other work with Drawings or templates showing locations of these items.
- B. Before installing stone countertops, clean dirty or stained stone surfaces by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber

brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives. Allow stone to dry before installing.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Level: Do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4 inch (6 mm) maximum.
- B. Variation in Joint Width: Do not vary joint thickness more than one-fourth of nominal joint width.
- C. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.
- D. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch (0.4-mm) difference between edges of adjacent units, where edge line continues across joint.

3.4 INSTALLATION OF COUNTERTOPS

- A. General: Install countertops over plywood subtops with full spread of water-cleanable epoxy adhesive.
- B. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight, true, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- C. Set stone to comply with requirements indicated. Shim and adjust stone to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.[]
- D. Install anchors and other attachments indicated or necessary to secure stone countertops in place.
- E. Bond joints with stone adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in stone edges at joints. Fill kerfs with stone adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Use power saws with diamond blades to cut stone. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- G. Install backsplashes and end splashes by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch (1.5-mm) gap between countertop and splashes for filling with sealant. Use temporary shims to ensure uniform spacing.

- H. Grout joints to comply with ANSI A108.10. Remove temporary shims before grouting. Tool grout uniformly and smoothly with plastic tool.
- I. Apply sealant to joints and gaps specified for filling with sealant; comply with Section 07920 "Joint Sealants." Remove temporary shims before applying sealant.

3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace stone countertops of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective countertops.
 - 3. Defective joints, including misaligned joints.
 - 4. Interior stone countertops and joints not matching approved Samples and mockups.
 - 5. Interior stone countertops not complying with other requirements indicated.
- C. Replace in a manner that results in stone countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
- D. Clean stone countertops no fewer than six days after completion of sealant installation, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.
- E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

END OF SECTION 06415

SECTION 06615 - CAST MARBLE TUB AND SHOWER PANEL SYSTEMS

Part 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Cast marble tub and shower panel systems, with related accessories.
2. Cast Marble Shower Pans
3. Typical rectangular vanity top without apron

1.02 REFERENCES

A. ANSI Z-124.1 - American National Standard for Plastic Fabrications; American National Standards Institute

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials

C. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association

Mincey Marble Mfg., Inc. – Master Specifications

Gainesville, GA 800.533.1806

Mincey Marble Mfg., Inc. 06 61 13 -2 Cast Marble

1.03 SUBMITTALS

A. Submit under provisions of Section 01330.

B. Product Data:

1. Manufacturer's printed product data indicating compliance with specified requirements.
2. Manufacturer's cleaning and maintenance data.

C. Shop Drawings:

1. Submit plans, elevations, and detail sections. Indicate overall dimensions, material thickness, location and size of cutouts, anchorage provisions and attachment methods. Indicate coordination requirements for adjacent and interfacing work.

D. Selection Samples: For each product specified, provide color chips or booklet representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, represent actual product, color, and patterns.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Member of International Cast Polymer Alliance (ICPA), with not less than five years of experience in manufacturing products similar to those required for this project.

B. Installer Qualifications: Not less than five installations of comparable scope within the past three years.

1. Provide list of contacts for recently completed projects.

2. Architect may inspect installations and reject proposed installer on the basis of references or quality of work.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques, application workmanship, and overall appearance of installation.

1. Install complete set of products in area designated by Architect.

2. Do not proceed with remaining work until workmanship, color, and finish have been approved by Architect.

3. Approved mock-up may become part of the work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cast marble materials until painting and similar operations that could damage the cast marble have been completed in installation areas.

B. Packing and Shipping: Pack countertops, tub and shower surrounds, and other flat products in wooden crates to minimize shipping damage. Palletize other components.

C. Check for shipping damage during unloading at site and notify manufacturer immediately of any obvious damage.

D. Store products under shelter, off the ground, and protected from moisture. Materials must be at room temperature prior to installation. Handle products to prevent physical damage. Protect surfaces from staining, scratching, and other damage during handling and installation.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify shop drawings with field measurements prior to fabrication.

B. Coordination: Coordinate construction activities of this section with construction activities specified in related sections.

1.07 WARRANTY

A. Tub and Shower Panel Systems: Manufacturer's five-year labor and materials warranty on defective materials.

PART 2 PRODUCTS

2.01 CAST MARBLE MATERIAL

A. MANUFACTURERS

1. Manufacturer: Mincey Marble Manufacturing, Inc.; 4321 Browns Bridge Road, Gainesville, GA 30504. Toll Free: 800-533-1806. Ph: 770.532.0451 Fax: 770-531-0935.

2. Or prior approved manufacturer.

B. MATERIALS

1. Provide cast marble fabrications made of proprietary resin and gel coat finish with finished properties as described under specific product types.

C. TUB AND SHOWER PANEL SYSTEMS

1. Material: MINCOR™ panels, Class A per ASTM E 84, with properties as follows per ASTM E 84: Flame Spread: 25 or less And Smoke Developed: 450 or less.

2. TS-VN Vintage Series: Thickness of 1/4 inch (6.3 mm); height and width as indicated on the drawings. TS-VN 3" x 6" Subway brick pattern – Gloss finish

D. Trim and Accessories: Matching trim and accessory pieces

E. Color and Pattern: As selected from manufacturer's standards.

2.02 INSTALLATION

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

B. Install in accordance with manufacturer's instructions and approved shop drawings. Install components to be plumb, level, and rigid. Neatly scribe to adjoining surfaces, and field trim as required for snug fit. Replace any component that is cracked, chipped, broken, or otherwise defective.

C. Tub and Shower Panel System: Cut openings as required for installation of plumbing fittings. Secure soap dishes to panels with silicone joint sealer, as recommended by panel manufacturer.

D. Adhesives and Sealants: As specified in Section 07 90 00, and as follows:

1. To adhere cast marble panels to gypsum wallboard, use LN-933 Liquid Nails, Nail-No-More, or other product recommended by manufacturer.
2. For joints between cast marble panels, use a mildew resistant 100 percent silicone joint sealer; siliconized caulking compound is not acceptable.
3. For sealing cast marble panels at adjoining surfaces such as gypsum wallboard, use mildew resistant latex calk joint sealer, such as Phenoseal Acrylic Caulk by Gibson-Homans, or other product recommended by cast marble panel manufacturer.

2.03 FABRICATION

- A. Use molds materials, methods, and procedures that will result in proper texture and finish.
- B. Fabricate to required profiles and dimensions. To the greatest extent possible, fabricate each unit as a continuous piece, without joints, and configured to minimize on-site cutting or other modifications.
- C. Ease all edges and sand smooth; provide uniform finish on all exposed surfaces.

PART 3 EXECUTION

3.01 PREPARATIONS

- A. Condition cast marble to room temperature (65 degrees or above) before handling

3.02 INSTALLATION

- A. All panel systems shall be installed as shown on Shop Drawings and as specified by mfg.
 1. Install components plumb, level and tightly to substrate. Scribe to adjacent finishes
 2. Remove all dust and other contaminants from back of panels
 3. Do not use water or denatured alcohol to clean back of panel. Use dry cloth.

3.03 CLEANING

- A. Protect surfaces of installed products until completion of project.

END OF SECTION

SECTION 07131 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Modified bituminous sheet waterproofing.
 - 2. Molded-sheet drainage panels.

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
 - 1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.
- C. Samples: For the following products:
 - 1. 12-by-12-inch (300-by-300-mm) square of waterproofing and flashing sheet.
 - 2. 4-by-4-inch (100-by-100-mm) square of drainage panel.
- D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.
- G. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is acceptable to waterproofing manufacturer for installation of waterproofing required for this Project.
- B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.
- C. Mockups: Before beginning installation, install waterproofing to 100 sq. ft. (9.3 sq. m) of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality.
 - 1. If Architect determines mockups do not comply with requirements, reapply waterproofing and reinstall overlying construction until mockups are approved.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period. This warranty shall be an all-inclusive labor and materials warranty.
1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch (1.6 mm) in width.
 2. Warranty Period: Seven years from date of Substantial Completion.
- B. Special Installer's Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.
1. Warranty includes removing and reinstalling protection board, drainage panels, and concrete decks.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Not less than 60-mil- (1.5-mm-) thick, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to a 4-mil- (0.10-mm-) thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Grace, W. R. & Co.; 4000 and Hydroduct 660 geocomposite protection layer.
 - b. Or prior approved equal.
 2. Physical Properties:
 - a. Tensile Strength: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
 - e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
 - f. Hydrostatic-Head Resistance: 150 feet (45 m) minimum; ASTM D 5385.
 - g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
 - h. Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m); ASTM E 96, Water Method.

2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid primer recommended for substrate by manufacturer of sheet waterproofing material.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.
- D. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.
- E. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
 - 1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches (114 mm) wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
 - 2. Detail Strips: 62.5-mil- (1.58-mm-) thick, felt-reinforced self-adhesive strip, 9 inches (229 mm) wide, with release film on adhesive side.
- F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 - 2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 3. Verify that compacted subgrade is dry, smooth, and sound; and ready to receive adhesive-coated HDPE sheet.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - 1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:
 - a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
 - b. At plaza deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.
- D. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).
- D. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.
- E. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.
- F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.
- G. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.
- I. Install protection course with butted joints over waterproofing membrane immediately.

- J. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.5 FIELD QUALITY CONTROL

- A. Contractor shall engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

3.6 PROTECTION AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07131

SECTION 07139 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The general provision of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

The extent of Geotextile/Bentonite Clay waterproofing membrane is shown on the drawings.

1.3 RELATED WORK

- A. Concrete
- B. Masonry
- C. Backfill
- D. Expansion Joints

1.4 QUALITY ASSURANCE

- A. Manufacturer: Provide Geotextile/Bentonite Clay waterproofing membrane produced by a manufacturer with a minimum of 5 years experience in the waterproofing industry.
- B. Installer: A firm with a minimum of 2 years experience in installing bentonite clay or other related waterproofing products.

1.5 SUBMITTALS

- A. Manufacturer: Submit six copies of product data sheets, specifications, installation instructions and general recommendations for each type of product specified.
- B. Installer: Submit detail drawings for installation of product specified.
- C. Warranty: Submit specimen of manufacturers' standard warranty.

1.6 WARRANTY

- A. Upon completion and acceptance of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials for a period of 5 years.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original manufacturer's packaging and store materials in strict accordance with manufacturer's instructions.
- B. Remove and replace products that have been prematurely exposed to moisture.

1.8 PROJECT CONDITIONS

- A. Install materials in accordance with all safety and weather conditions required by the manufacturer.
- B. Install materials only after work on the applicable substrate is complete.

PART 2 – PRODUCTS

2.1 WATERPROOFING SYSTEM

A. The Geotextile/Bentonite clay waterproofing membrane shall be CCW MiraCLAY supplied by Carlisle Coatings & Waterproofing Incorporated, 900 Hensley Lane, Wylie, Texas 75098, Phone (800) 527-7092 Fax: (972) 442-0076 OR EQUAL PRODUCT BY VOLCLAY.

B. Physical Properties for Geotextile/Bentonite Clay Waterproofing Membrane:

CCW MiraCLAY Physical Properties:

Property	Test Method	Value
Bentonite Content	—	1.0 lb./ft ² (.488 kg/m ²)*
Nominal Dry Thickness —		0.25 in. (6.4 mm)
Weight —		75 lb./ft ² (34.05 kg/m ²)
Permeability	ASTM D 5084	5 x 10 ⁻⁹ cm/sec
Grab Tensile Strength	ASTM D 4632	95 lb. (422 N)
Grab Elongation	ASTM D 4632	150%
Puncture Resistance	ASTM D 4833	120 psi (828 kPa)
Hydrated Internal Shear	ASTM D 5321	500 psf (24 kPa)
Swell Index	ASTM D 5890	2g (24 ml) min.
Fluid Loss	ASTM D 5891	18 ml max

*@ 12% moisture content

C. Waterproofing system accessories supplied by waterproofing membrane manufacturer:

Mastic: CCW MiraCLAY Mastic is used for detailing at terminations and penetrations. Also used to fill minor voids in concrete and as a fillet in angle changes.

Granules: CCW MiraCLAY Granules used for horizontal to vertical transitions and for detailing at seams and slab penetrations.

Waterstop: CCW MiraSTOP used as a waterstop at cold concrete pours and between pre-cast concrete panels.

D. Membrane to Substrate Fasteners: Fasteners, of the type and length suitable for the substrate, shall be used in conjunction with washers, of at least 1" diameter, to attach the geotextile/bentonite clay waterproofing membrane to the substrate.

E. Membrane to Membrane Fasteners: Mechanically fasten membrane sheets together with a box-stapler or similar device for horizontal applications.

F. The Geotextile/Bentonite membrane shall consist of geotextile panels of sodium bentonite clay sandwiched between two layers of needle-punched woven and non-woven polypropylene fabrics.

G. Drainage Composite: Shall be CCW MiraDRAIN® as recommended by the manufacturer for each condition.

H. Perimeter Drainage System: Where required shall be CCW QuickDRAIN™.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine substrate and condition under which waterproofing will be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. *Note: Prior to beginning the below grade work, the contractor shall receive written approval from bentonite manufacturer that the proposed granular fill beneath the areas to receive the bentonite waterproofing are an acceptable substrate or the product. This information shall be forward to the architect.*

3.2 SURFACE PREPARATION

- A. Grade Substrates: Shall be level and uniform that is compacted to a minimum of 85% modified proctor.
- B. Concrete Application:
 - 1. Apply CCW MiraCLAY Mastic to all construction joints at a minimum of 1/4" (7mm) thickness and a 3" (8cm) minimum width.
 - 2. Remove projections from the wall surface in excess of 3/4" (20mm).

3.3 INSTALLATION

- A. Prevent geotextile/bentonite clay waterproofing membrane from hydrating before being covered with overburden. When threat of rain is imminent or backfill is not immediate, geotextile/bentonite clay waterproofing membrane should be covered with polyethylene sheeting.
- B. Underslab Application:
 - 1. Install CCW MiraCLAY with the stenciled side up.
 - 2. Overlap edges a minimum of 4" (10cm).
 - 3. Protect CCW MiraCLAY from damage caused by chairs with sharp edges or points by placing a patch of CCW MiraCLAY under the chair.
 - 4. Staple joints often enough to prevent excessive movement.
 - 5. Pour CCW MiraCLAY Granules or trowel CCW MiraCLAY Mastic around all penetrations and press in "cut to fit" collars of CCW MiraCLAY.
 - 6. Extend the installation of CCW MiraCLAY 12" (31 cm) up or beyond the perimeter slab forms.
 - 7. Inspect and repair any damaged material before concrete pour.
- C. Concrete Wall Application:
 - 1. Install CCW MiraCLAY with the stenciled side out.
 - 2. Starting at the bottom of the wall, unroll CCW MiraCLAY and nail across top of panel one nail per 12" (31cm) on center. Allow sheet to hang down nailing only as required to stabilize.
 - 3. Install adjacent membrane by overlapping edges a minimum of 4" (10cm).
 - 4. Fasten membrane once every 18" (45cm) on seams or as required to prevent blousing with 3/4" (20mm) to 1" (25mm) concrete nails with washers.
 - 5. Extend waterproofing membrane to or above grade and fasten membrane once every 12" (31cm) or use termination bar. Trowel a 1/2" (12mm) thick and 2' (5cm) wide bead of CCW MiraCLAY Mastic at top edge of membrane.
 - 6. Create a cant at any vertical to horizontal transition by applying a 1.5" to 2" (4cm to 5cm) cant of CCW MiraCLAY Granules or CCW MiraCLAY Mastic.
 - 7. Strip in all corners and transitions with a 12" to 15" (31cm to 39cm) piece of CCW MiraCLAY membrane to double cover these areas.

3.4 PROTECTION AND DRAINAGE

1. Protect the geotextile/bentonite clay waterproofing membrane with CCW MiraDRAIN Drainage Composite.
2. Install the CCW MiraDRAIN Drainage Composite according to the detailed drawings for the specific installation requirements of the project.

END OF SECTION

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber Thermal/Sound blanket insulation.
 - 2. Spray polyurethane foam insulation.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- B. Research/Evaluation Reports: For foam-plastic insulation, from [ICC-ES] <Insert applicable model code organization>.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation.
 - 2. Johns Manville.
 - 3. Owens Corning.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Polypropylene-Scrim-Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).
- D. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
 - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
 - 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.2 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. BaySystems NorthAmerica, LLC.
 - c. Dow Chemical Company (The).
 - d. Henry Company.
 - 2. Minimum density of 1.5 lb/cu. ft. (24 kg/cu. m), thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F (43 K x m/W at 24 deg C).

2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
 - 1. Products: Subject to compliance with requirements, provide one of the following:

- a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Gemco; Spindle Type.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AGM Industries, Inc.; RC150.
 - b. Gemco; Dome-Cap or R-150 Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - c. Crawl spaces.
 - d. Ceiling plenums.
 - e. Attic spaces.
 - f. Where indicated.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AGM Industries, Inc.; TACTOO Adhesive.
 - b. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.4 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches (1219 mm) up either side of partitions.

3.5 INSTALLATION OF EXPOSED CEILING FACED INSULATION

- A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to underside of existing floor deck above with insulation anchor adhesive according to anchor manufacturer's written instructions or mechanical fasteners as needed. Space anchors at 24 inches in each direction staggering every other row fasteners.
 - 2. After adhesive has dried, install batt/blanket insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness. Insulation is to be facing downward to the floor.

3. Drape insulation below beams, pipes and conduits at the floor deck. Coordinate with architect prior to installation.
4. Apply capped washers to tips of spindles.
5. Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

3.6 INSTALLATION OF SPRAY APPLIED INSULATION AT UNDERSIDE OF ELEVATED FLOOR DECK

- A. Contractor to complete patching of spray applied fire proofing.
- B. Verify compatibility of spray applied insulation and existing fire proofing prior to ordering materials. Proceed only after it is determined that insulation is compatible with fire proofing and determining that fire proofing is capable of supporting added weight of insulation.
- C. Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets at underside for floor deck completed and items not indicated to receive insulation are masked. Insulation to be installed at thickness need to achieve R Value indicated on the drawings.

3.7 PROTECTION

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

3.8 INSULATION SCHEDULE

- A. Insulation Type 1 (Thermal/Sound Wall Insulation): Unfaced, glass-fiber blanket insulation; match thickness of stud framing
- B. Insulation Type 2 (Ceiling Insulation): Polyurethane spray foam insulation.

END OF SECTION 07210

SECTION 07275 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Building paper.
- 2. Building wrap.
- 3. Flexible flashing.

- B. Related Requirements:

- 1. Division 6 Section "Sheathing" for sheathing joint and penetration treatment.
- 2. Division 7 Section "Self-Adhering Sheet Air Barriers" for sheet air barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

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

- 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

1.4 Special Warranty

- A. Special weather-barrier manufacturer's warranty for weather barrier for a period of ten (10) years from date of purchase. Pre-installation meetings and jobsite observations by weather barrier manufacturer for warranty are required.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.
- B. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper.

1. Water vapor transmission not less than 35 g/sq. m x 24 hr per ASTM D 779.
 2. Water resistance not less than 20 minutes per ASTM F 1249.
- C. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
1. Products: Subject to compliance with requirements, provide the following or approved equal:
 - a. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
 2. Water-Vapor Permeance: Not less than 200 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).
 3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg (0.02 L/s x sq. m at 75 Pa) when tested according to ASTM E 2178.
 4. Allowable UV Exposure Time: Not less than three months.
- D. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing.
 - b. Polyguard Products, Inc.; Polyguard JT-30 Tape.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- C. Nails and Staples: ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.

2. Apply barrier to cover vertical flashing with a minimum **4-inch (100-mm)** overlap unless otherwise indicated.
- C. Building Paper: Apply horizontally with a **2-inch (50-mm)** overlap and a **6-inch (150-mm)** end lap; fasten to sheathing with galvanized staples or roofing nails.
- D. Building Wrap: Comply with manufacturer's written instructions.
1. Seal seams, edges, fasteners, and penetrations with tape.
 2. Extend into jambs of openings and seal corners with tape.

3.2.1 FIELD QUALITY CONTROL

- A. Notify manufacturer's designated representative to obtain [required] periodic observations of weather barrier assembly installation.

3.3 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
1. Prime substrates as recommended by flashing manufacturer.
 2. Lap seams and junctures with other materials at least **4 inches (100 mm)** except that at flashing flanges of other construction, laps need not exceed flange width.
 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 4. Lap water-resistive barrier over flashing at heads of openings.
 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 07275

SECTION 07311 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Asphalt shingles.
 - 2. Felt underlayment.
 - 3. Self-adhering sheet underlayment.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of asphalt shingle, ridge and hip cap shingles indicated.
 - 1. Include similar Samples of trim and accessories involving color selection.
- C. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain ridge and hip cap shingles, felt underlayment and self-adhering sheet underlayment through one source from a single asphalt shingle manufacturer.
- B. Fire-Test-Response Characteristics: Provide asphalt shingle and related roofing materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
 - 1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 PROJECT CONDITIONS

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

1.8 WARRANTY

- A. Installer's Project Warranty: Roofing Installer's warranty, on warranty form at end of this Section, signed by roofing Installer, covering Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Manufacturer's Special Project Warranty: Roofing Manufacturer's warranty, signed by roofing Manufacturer, covering Work of this Section, in which roofing manufacturer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within the following warranty period. This warranty specifically covers materials, labor, tear-off, disposal and workmanship for the entire warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
1. Products:
 - a. CertainTeed Corporation, Landmark TL;
 - b. GAF Materials Corporation; Timberline Select 40.
 2. Strip Size: Manufacturer's standard.
 3. Algae Resistance: Granules treated to resist algae discoloration.
 4. Color and Blends: As selected by Architect from manufacturer's full range in order to match existing buildings.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

- A. Felts: ASTM D 226 or ASTM D 4869, Type II, asphalt-saturated organic felts, non-perforated.
- B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum of 40-mil- (1.0-mm-) thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.
1. Products:
 - a. Grace, W. R. & Co.; Grace Ice and Water Shield.
 - b. Johns Manville International, Inc.; Roof Defender
 - c. Note: Paragraph 1.5A requires that all products be from a single source. The installer may install a self-adhering sheet underlayment by one of the manufacturers listed above if a notarized letter is received from the manufacturer of the shingle indicating that this deviation will not void the warranty provisions listed in this specification section.
 - d. Or equal product by Certainteed or GAF.

2.4 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with external deflector baffles; for use under ridge shingles.

1. Products:
 - a. Cor-A-Vent, Inc.; X-5 X-treme Ridge Vent
 - b. Or equal product by GAF or AirVent, Inc.
2. Minimum Net Free Area: 17 sq. in. per linear foot (35986 sq mm / m).
3. Width: 11"
4. Thickness: 13/16".

2.5 STATIC ROOF VENTS

- A. Non-powered roof vent: Manufacturer's standard aluminum Slant-Back Metal Roof Vent.
 1. Products:
 - a. Lomanco; Model 770D Slant-Back Metal Roof Vent with 140 sq. inches of free area per piece
 - b. Air Vent, Inc.; Slant-Back Metal Roof Vent 70 sq. inches net free area per piece – increase number of vents to equal amount shown on drawings.
 - c. Or equal product by Masterflow.

2.6 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; stainless-steel, or hot-dip galvanized steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, ring-shank, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19mm) into plywood decking. Nails shall not touch or penetrate the metal deck.
 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized steel wire with low profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

2.7 METAL FLASHING AND TRIM

- A. Sheet Metal Flashing and Trim: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
 1. Sheet Metal: Prepainted, metallic-coated steel.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.
 1. Apron Flashings: Fabricate with lower flange a minimum of 5 inches (125 mm) over and 4 inches (100 mm) beyond each side of downslope asphalt shingles and 6 inches (150 mm) up the vertical surface.

2. Step Flashings: Fabricate with a headlap of 2 inches (50 mm) and a minimum extension of 5 inches (125 mm) over the underlying asphalt shingle and up the vertical surface.
 3. Cricket Flashings: Fabricate with concealed flange extending a minimum of 24 inches (600 mm) beneath upslope asphalt shingles and 6 inches (150 mm) beyond each side of roof curb and 6 inches (150 mm) above the roof plane.
 4. Open Valley Flashings: Fabricate in lengths not exceeding 10 feet (3 m) with 1-inch- (25-mm-) high inverted-V profile at center of valley and equal flange widths of 12 inches (300 mm).
 5. Drip Edges: Fabricate in lengths not exceeding 10 feet (3 m) with 2-inch (50-mm) roof deck flange and 2-inch (50-mm) fascia flange with 3/8-inch (9.6-mm) drip at lower edge.
- C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches (100 mm) from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Single-Layer Felt Underlayment: Install single layer of felt underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with underlayment roofing nails.
1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches (75 mm) in direction to shed water. Lap ends of felt not less than 6 inches (150 mm) over self-adhering sheet underlayment.
- B. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below, lapped in direction to shed water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches

(600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.

1. Eaves: Extend from edges of eaves 36 inches (914 mm) beyond interior face of exterior wall.
2. Rakes: Extend from edges of rake 36 inches (914 mm) beyond interior face of exterior wall.
3. Valleys: Extend from lowest to highest point 18 inches (450 mm) on each side.
4. Hips: Extend 18 inches (450 mm) on each side.
5. Ridges: Extend 36 inches (914 mm) on each side without obstructing continuous ridge vent slot.

C. Metal-Flashed, Open-Valley Underlayment: Install two layers of 36-inch- (914-mm-) wide felt underlayment centered in valley. Stagger end laps between layers at least 72 inches (1830 mm). Lap ends of each layer at least 12 inches (300 mm) in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck with nails.

1. Lap roof-deck felt underlayment over first layer of valley felt underlayment at least 6 inches (150 mm).

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."

1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

C. Step Flashings: Install with a headlap of 2 inches (50 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Open Valley Flashings: Install centrally in valleys, lapping ends at least 8 inches (200 mm) in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.

1. Secure hemmed flange edges into metal cleats spaced 12 inches (300 mm) apart and fastened to roof deck.

F. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.

G. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT SHINGLE INSTALLATION

- A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 1/2 inch (13 mm) over fascia at eaves and rakes.
 - 2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- E. Fasten asphalt shingle strips with a minimum of four roofing nails or number required by manufacturer to meet required loading conditions described in this specification section located according to manufacturer's written instructions.
- F. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips. Maintain uniform width of exposed open valley from highest to lowest point.
 - 1. Set valley edge of asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.
 - 2. Do not nail asphalt shingles to metal open valley flashings.
- G. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- H. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 - 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.5 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____ (address) herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: _____
2. Address: _____
3. Building Name/Type: _____
4. Address: _____
5. Area of Work: _____
6. Acceptance Date: _____
7. Warranty Period: _____
8. Expiration Date: _____

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding 110 mph (m/sec);
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof,

this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this ____day of _____, 20____.

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

END OF SECTION 07311

SECTION 07460 - SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fiber-cement siding.
 - 2. Fiber-cement soffit.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For siding and soffit including related accessories.
- C. Samples for Verification: For each type, color, texture, and pattern required.
 - 1. 12-inch- (300-mm-) long-by-actual-width Sample of siding.
 - 2. 24-inch- (600-mm-) wide-by-36-inch- (900-mm-) high Sample panel of siding assembled on plywood backing.
 - 3. 12-inch- (300-mm-) long-by-actual-width Sample of soffit.
 - 4. 12-inch- (300-mm-) long-by-actual-width Samples of trim and accessories.
- D. Product Certificates: For each type of siding and soffit, from manufacturer.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- F. Research/Evaluation Reports: For each type of siding required, from the ICC.
- G. Maintenance Data: For each type of siding and soffit and related accessories to include in maintenance manuals.
- H. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- B. Source Limitations: Obtain each type, color, texture, and pattern of siding and soffit, including related accessories, from single source from single manufacturer.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups for siding and soffit including accessories.
 - a. Size: 120 inches long by 120 inches high of wall siding and 120 inches long for soffit.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in a dry, well-ventilated, weathertight place.

1.6 COORDINATION

- A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.7 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace siding and soffit that fail(s) in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking, deforming
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corp.
 - b. James Hardie.
 - 2. Horizontal Pattern: Boards 7-1/4 to 7-1/2 inches (184 to 190 mm) wide in plain style.
 - a. Texture: Smooth.
 - 3. Factory Priming: Manufacturer's standard acrylic primer.

2.2 FIBER-CEMENT SOFFIT

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corp.
 - b. James Hardie.
- B. Pattern: 24-inch- (600-mm-) wide sheets with smooth texture.
- C. Ventilation: Provide perforated soffit unless otherwise indicated.
- D. Factory Priming: Manufacturer's standard acrylic primer.

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories made from same material as adjacent siding unless otherwise indicated.
- B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:
 - 1. Corner posts.
 - 2. Door and window casings.

3. Pilasters.
 4. Fasciae.
 5. Moldings and trim.
- C. Flashing: Provide stainless-steel flashing complying with Division 7 Section "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- D. Fasteners:
1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
 2. For fastening fiber cement, use stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with siding and soffit manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 1. Do not install damaged components.
 2. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- B. Install fiber-cement siding and soffit and related accessories.
 1. Install fasteners no more than 24 inches (600 mm) o.c.
- C. Install joint sealants as specified in Division 7 Section "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07460

SECTION 07543 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Adhered TPO membrane roofing system.
 - 2. Roof insulation.
- B. Not included in section:
 - 1. Required manufactured flashing as part of 30 year warranty system. Contractor shall provided all components required and modify roofing details accordingly.

1.3 DEFINITIONS

- A. TPO: Thermoplastic polyolefin.
- B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
 - 1. Corner Uplift Pressure: 225 lbf/sq. ft.
 - 2. Perimeter Uplift Pressure: 150 lbf/sq. ft.
 - 3. Field-of-Roof Uplift Pressure: 90 lbf/sq. ft.

- D. Fasten roofing system in accordance with FM Fire/Windstorm Classification: Class 1A-120.
- E. Hail Resistance: SH
- F. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Base flashings and membrane terminations.
 - 2. Tapered insulation, including slopes.
 - 3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of compliance with performance requirements.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.
- D. Field quality-control reports.
- E. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

- C. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- D. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.10 PROJECT CONDITIONS

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

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of membrane roofing system.
 - 2. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Firestone Building Products Company. UltraPly Platinum TPO System.
 - 2. Thickness: 80 mils (1.5 mm), nominal.
 - 3. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 - 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.

- b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Single-Ply Roof Membrane Adhesives: 250 g/L.
 - f. Other Adhesives: 250 g/L.
 - g. Single-Ply Roof Membrane Sealants: 450 g/L.
 - h. Nonmembrane Roof Sealants: 300 g/L.
 - i. Sealant Primers for Nonporous Substrates: 250 g/L.
 - j. Sealant Primers for Porous Substrates: 775 g/L.
- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated. Minimum average R value = 15. Minimum thickness is 1 1/2".
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

- C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphalt, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- D. Bead-Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- E. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- F. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch (6 mm) thick[, factory primed].
 - 1. Products: Subject to compliance with requirements, provide the following or approved equal:
 - a. Georgia-Pacific Corporation; Dens Deck.
- G. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

2.5 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
 - 1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.4 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.
- B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.
- D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- F. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- G. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.
- H. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing membrane roofing system.

3.5 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

3.6 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

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

3.9 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner: <Insert name of Owner>.
 - 2. Address: <Insert address>.
 - 3. Building Name/Type: <Insert information>.
 - 4. Address: <Insert address>.
 - 5. Area of Work: <Insert information>.
 - 6. Acceptance Date: <Insert date>.
 - 7. Warranty Period: <Insert time>.
 - 8. Expiration Date: <Insert date>.

- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding <Insert wind speed> mph (m/sec);
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for

Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.
2. Name: <Insert name>.
3. Title: <Insert title>.

END OF SECTION 07543

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Solid-core doors with wood-veneer and hardboard/MDF faces.
2. Hollow-core doors with hardboard/MDF faces.
3. Shop priming and factory finishing flush wood doors.
4. Factory fitting flush wood doors to frames and factory machining for hardware.

- B. Related Requirements:

1. Section 06202 "Interior Finish Carpentry for wood door frames.
2. Section 09900 Painting for field finishing doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

- C. Samples for Initial Selection: For factory-finished doors.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty Period for Solid-Core Interior Doors: Life of installation.
 - 3. Warranty Period for Hollow-Core Interior Doors: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Ampco.
 - 3. Chappell Door Co.
 - 4. General Veneer Manufacturing Co.
 - 5. Graham Wood Doors; an Assa Abloy Group company.
 - 6. Haley Brothers, Inc.
 - 7. Ipik Door Company.
 - 8. Lambton Doors.
 - 9. Marlite.
 - 10. Marshfield Door Systems, Inc.
 - 11. Mohawk Doors; a Masonite company.

12. Oshkosh Door Company.
 13. Vancouver Door Company.
 14. VT Industries, Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer
- C. Flush Wood Doors with Hardboard faces: following:
1. Masonite Corporation, 1 Panel Shaker Door Designs, "MDF Door" Series with a wood fiber core (Craftcore) as noted on door
 2. Millennium Doors, Infinity Standard Flush Door Profile 101 with particleboard core and hardboard faces and inset panel molding for non-rated and 20-minute
- D. FLUSH WOOD DOORS, GENERAL
- E. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- F. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
- G. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-1, made with binder containing no urea-formaldehyde.
 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
- H. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - a. Screw-Holding Capability: [550 lbf (2440 N)] [475 lbf (2110 N)] [400 lbf (1780 N)] per WDMA T.M.-10.

I. Hollow-Core Doors:

1. Construction: Standard] hollow core.
2. Blocking: Provide wood blocking with minimum dimensions as follows:
 - a. 5-by-18-inch (125-by-460-mm) lock blocks at both stiles].
 - b. 5-inch (125-mm) top- and bottom-rail blocking.

2.2 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium.
2. Faces: Any closed-grain hardwood of mill option.
3. Exposed Vertical Edges: Any closed-grain hardwood.
4. Core: Particleboard.
5. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

B. Interior Hollow-Core Doors <Insert drawing designation>:

1. Grade: Premium.
2. Faces: Hardboard or MDF.
 - a. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).
 - b. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.
3. Exposed Vertical Edges: Any closed-grain hardwood.

2.3 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2.4 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in [Section 09911 "Exterior Painting."] [Section 09912" Interior Painting.]

- B. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as specified in Section 09931 "Wood Stains and Transparent Finishes." Seal edges of cutouts and mortises with first coat of finish.

2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors that are indicated to receive transparent finish.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 11, catalyzed polyurethane.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08710 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or

permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08211

SECTION 08541-FIBERGLASS WINDOWS

Part 1 General

1.1 Section Includes

- A. All fiberglass single hung window complete with hardware, glazing, weather strip, insect screen, grille-between-the-glass, jamb extension, sheet rock return, j-channel, and standard or specified anchors, trim and attachments.

1.2 References

- A. American Society for Testing and Materials (ASTM):
 - 1. C1036: Standard Specification for Flat Glass
 - 2. E90-09: Standard Test Method for Laboratory Measurement of airborne Sound Transmission Loss of Building Partitions and Elements.
 - 3. E 283: Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
 - 4. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Door by Uniform Static Air Pressure Difference.
 - 5. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
 - 6. E 2190: Standard Specification for Insulating Glass Unit Performance Evaluation.
 - 7. F2090-10: Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms.
 - 8. E 2068: Standard Test Method to Determine the Operating and Breakaway Forces of Sliding Windows and Doors.
- B. Insulating Glass Manufactures Alliance/Insulating Glass Certification Council (IGMA/IGCC)
- C. American Architectural Manufacturers Association/Window and Door Manufacturers Association/Canadian Standards Association (AAMA/WDMA/CSA):
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440-11: North American Fenestration Standard/Specification for windows, doors, and skylights.
 - 2. AAMA/WDMA/CSA 101/I.S.2/A440-08: North American Fenestration Standard/Specification for windows, doors, and skylights.

- D. Window and Door Manufacturers Association (WDMA): Hallmark Certification Program.
- E. American Architectural Manufacturers Association (AAMA): 623-10: Voluntary Specification, Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles.
- F. National Fenestration Rating Council (NFRC):
 - 1. 100: Procedures for Determining Fenestration Product U-factors
 - 2. 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

1.3 System Description

- A. Design and Performance Requirements:
 - 1. Structural tested to 50 psf
 - 2. Air tested to 1.57 psf
 - 3. Water tested to 7.52 psf

1.4 Submittals

- A. Shop Drawings: Submit shop drawings under provision of Section 01330.
- B. Product Data: Submit catalog data under provision of Section 01330.
- C. Samples:
 - 1. Submit corner section under provision of section 01330.
 - 2. Specified performance and design requirements under provisions of Section 01330
- D. Quality Control Submittals: Certificates: submit manufacture's certification indicating compliance with specified performance and design requirement under provision of section 01 33 23.

1.5 Quality Assurance

- A. Requirements: consult local code for IBC [International Building Code] and IRC [International residential Code] adoption year and pertinent revisions for information on:
 - 1. Egress, emergency escape and rescue requirements
 - 2. Basement window requirements
 - 3. Windows fall prevention and/or window opening control device requirements.

1.6 Delivery

- A. Deliver in original packaging and protect from weather.

1.7 Storage and Handling

- A. Store window units in an upright position in a clean and dry storage area above ground to protect from weather under provision of Section 01 66 00.

1.8 Warranty

- A. Clear insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from (10) years from the original date of purchase.
- B. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

Part 2 Products

2.1 Manufactured Units

- A. Description: All Ultrex® Single Hung (and related stationary or picture units) as manufactured by Integrity Windows and Doors, West Fargo, North Dakota and Roanoke, Virginia or prior approved equal.

2.2 Frame Description

- A. Interior: Pultruded reinforced fiberglass (Ultrex®), 0.070" (2mm) thick.
- B. Frame width: 3 3/32" (79mm)
- C. Jamb depth: 2" (51mm)

2.3 Sash/Panel Description

- A. Pultruded reinforced fiberglass (Ultrex®), 0.070" (2mm) thick
- B. Composite sash thickness: 15/16" (24mm)
- C. Equal sash style. Cottage Style: Sash divided 2/5 over 3/5. Reverse Cottage Style: Sash divided 3/5 over 2/5.

2.4 Glazing

- A. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC when tested in accordance with ASTM E 2190. STC/OITC ratings are tested to the stated performance level in accordance with ASTM E 90-09.
- B. Glazing Method: 11/16" (17mm) insulated glass
- C. Glass Type: LoE – 180™ with Air or Argon Gas
- D. Glazing Seal: Silicone bedding at exterior. Interior has glazing boot.

2.5 Finish

- A. Exterior: Ultrex with a cross-head extruded acrylic organic coating system. Meets AAMA 623-10 requirements.
- B. Interior: Ultrex with a cross-head extruded acrylic organic coating system. Meets AAMA 623-10 and 00022716 requirements.
- C. Color: Stone White exterior with Stone White interior

2.6 Hardware

- A. Balance System: Coil spring block and tackle with nylon cord, glass filled nylon show, and zinc locking mechanism.
- B. Lock: High pressure zinc die-cast cam lock and keeper.

1. Finish: Phosphate coated and electrostatically painted. Color: Stone White.
Optional colors: Bright Brass, Satin Nickel, Oil Rubbed Bronze, Almond Frost.
 2. Two (2) locks installed on 30 and wider units.
- C. Sash Lift: A contoured zinc die cast sash lift, Stone White in color.
- D. Tilt Latches: Ergonomic tilt latches attach to the upper corners of the bottom sash for easy tilting and sash removal.
- E. Sash Limiters: Available as a field applied option to limit sash travel. ABS material and beige in color. Applied in the balance tube channel.
- F. Factory Installed Window Opening Control Device for operating units per ASTM F2090-10: a system consisting of an acetal lever housed in an acetal shell on each stile of the top sash.
1. Available on all sizes
 2. Color: White

2.7 Weather Strip

- A. Frame weather strip: combination hollow vinyl bulb and flexible wand
1. Color: Beige
- B. Top Sash interlock: Rigid ABS with flexible Alcryn seals
1. Color: Beige
- C. Stationary sash seal: foam tape
1. Color: Gray

2.8 Jamb Extension

- A. Standard 2" jambs. Optional factory installed jamb extension: 4 9/16" (116mm) and 6 9/16" (167mm)

2.9 Insect Screen

- A. Factory installed half screen
- B. Screen mesh, 18 by 16: Charcoal fiberglass. Pile weather strip on top rail of screen seals against top sash.
- C. Aluminum frame
1. Color: Stone White

- A. 11/16" (17mm) contoured aluminum bar.
- B. Stone white interior, exterior color determined by frame color.
- C. Lite Cuts or Patterns:
 - 1. Rectangular lite cut.

2.11 Accessories and Trim

- A. Installation Accessories:
 - 2. Factory installed vinyl nailing fin.
 - 3. Mullion kit: standard mullion kit for filed assembly of related units available in horizontal, vertical and 2-wide and/or 2-high configurations. Kit includes: Instruction, interior and exterior mull covers, mull plugs and brackets.
- B. Exterior Casing:
 - 4. Non-integral to the unit. Fastened to the exterior wall with barb and kerf.
 - 5. 2" Brick Mould available as a full surround or with sill nosing.
 - 6. 3 ½" Flat Casing available as a full surround or with sill nosing. Also available with 1" Ranch Style header and sill overhang.
 - 7. Colors: Stone White

Part 3 Execution

3.1 Examination

- A. Verification of Condition: Before installation, verify openings are plumb, square and of proper dimensions as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding,
- B. Acceptance of Condition: Beginning installation confirms acceptance of existing conditions.

3.2 Installation

- A. Assemble and install window/door unit(s) according to manufacturer's instruction and reviewed shop drawing.
- B. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 92 00 Joint Sealants. Do not use expansive foam sealant.
- C. Install accessory items as required.
- D. Use finish nails to apply wood trim and mouldings.

3.3 Cleaning

- A. Remove visible labels and adhesive residue according to manufacturer's instruction.
- B. Leave windows and glass in a clean condition.

3.4 Protecting Installed Construction

- A. Protecting windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

End of Section

SECTION 08542-FIBERGLASS DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass clad wood swinging door and frame, complete with hardware, glazing, weather strip, removable grilles, grilles-between-the glass, simulated divided lite, jamb extension, and standard or specified anchors, trim and attachments.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. E 283: Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
 - 2. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtains Walls, and Doors by Uniform Static Air Pressure Difference.
 - 3. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
 - 4. E 2190: Standard Specification for Sealed Insulating Glass Units Performance and Evaluation.
 - 5. E 1886: Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
 - 6. E 1996: Standard Specifications for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
 - 7. C 1036: Standard Specification for Flat Glass.
 - 8. E 90-09: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- B. Window and Door Manufactures Association (WDMA): I.S.4: Industry Standard for Water Repellent Preservative Treatment for Millwork.
- C. Sealed Insulating Glass Manufactures Association / Insulating Glass Certification Council (SIGMA / IGCC).
- D. American Architectural Manufacturers Association, Window and Door Manufacturers Association, Canadian Specification Association (AAMA / WDMA/CSA):
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440-05: Standard/ Specification for windows, doors, and unit skylights.
 - 2. AAMA/WDMA/CSA 101/I.S.2/A440-08: North American Fenestration Standard/ Specification for windows, doors, and unit skylights.
- E. Window and Door Manufacturers Association (WDMA): Hallmark Certification Program.
- F. American Architectural Manufactures Association (AAMA): 623-10 Voluntary Specification, Performance Requirements and Test Procedures for Organic Coating on Fiber Reinforced Thermoset Profiles.
- G. National Fenestration Rating Council (NFRC): 101: Procedure for Determining Fenestration Product Thermal Properties.

1.3 SYSTEM DESCRIPTION

- A. Design and Performance Requirements

- 1. Inswing

- a. Units shall be designed to comply with AAMA/WDMA/CSA 101/I.S.2/A440-05 (HGD-LC30) AAMA/WDMA/CSA 101/I.S.2/A440-08 (LC-PG30) rating.
- b. Air leakage shall not exceed 0.30 cfm per linear foot of sash crack when tested at 1.57 psf according to ASTM E 283.
- c. No water penetration when tested at 4.5 psf according to ASTM E 547.
- d. Units shall be designed to comply with ASTM E330 for structural performance when tested at the following pressures: (+/-45 psf).
- e. Forced Entry Resistance, complies with AAMA 1304-02.

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings under provisions of Section 01330.
- B. Product Data: Submit catalog data under provisions of Section 01330.
- C. Samples:
 1. Submit corner section under provisions of Section 01330.
 2. Include glazing system, quality of construction, and specified finish.
- D. Quality Control Submittals: Certificates: Submit manufacturer's certifications indicating compliance with specified performance and design requirements under provisions of Section 01330.

1.5 QUALITY ASSURANCE

- A. Code Requirements: Consult local code for IBC [International Building Code] and IRC [International Residential Code] adoption year and pertinent revisions for information on:
 1. Egress, emergency escape, and rescue requirements
 2. Basement window requirements
 3. Window fall prevention and window opening control device requirements

1.6 DELIVERY

- A. Deliver in original packaging and protect from weather.

1.7 STORAGE AND HANDLING

- A. Prime or seal wood surfaces, including surface to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation.
- B. Store door panels flat on a level surface in a clean and dry storage area. Seal unfinished top and bottom edges of door panels if stored at the job site more than one (1) week.
- C. Condition doors to local average humidity before hanging.

1.8 WARRANTY

- A. Doors shall be warranted to be free from defects in manufacturing, materials, and workmanship for a period of ten (10) years from purchase date.
- B. Door glass shall be warranted to be free from defects in manufacturing, materials and workmanship for a period of twenty (20) years from the purchase date.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

- A. Description: Factory assembled Ultrex® Swinging Door, as manufactured by Integrity Windows and Doors, West Fargo, North Dakota or Roanoke, Virginia.

2.2 FRAME DESCRIPTION

- A. Interior: Clear pine exposed surfaces.
 - 1. Kiln dried to a moisture content no greater than twelve (12) percent at the time of fabrication.
 - 2. Water repellent, preservative treated in accordance with ANSI / NWWDA I.S.4.
- B. Exterior: Fiberglass reinforced (Ultrex®) clad 0.080 inch (2 mm) thick.
- C. Composite frame thickness: 1-11/32 inches (36 mm).
- D. Frame width: 4-9/16 inches (116 mm). Beige fiberglass reinforced plastic (Ultrex®) sill with oak interior sill liner.

2.3 PANEL DESCRIPTION

- A. Interior: Finger jointed cores with clear pine veneers.
 - 1. Kiln dried to a moisture content no greater than twelve (12) percent at time of fabrication. Panel corners mortised and tenoned.
 - 2. Water repellent preservative treated in accordance with ANSI / NWWDA I.S.4.
- B. Core material: Laminated veneered lumber (LVL).
- C. Exterior: Fiberglass reinforced (Ultrex®) clad 0.110 inch (2.8 mm) thick.
- D. Composite panel thickness: 1-3/4 inches (44mm).
- E. Rail height dimension: top rail 3 5/8 inches (92 mm), bottom rail 6 inches (152 mm).

2.4 GLAZING

- A. Select quality complying with ASTM C 1036. Insulating glass is manufactured and tested to pass level ASTM E 2190 and is IGCC certified.
- B. Glazing Method: 3/4 inch (19 mm) Tempered Insulating Glass
- C. Glass type: LoE - 180™ with Air or Argon gas.
- D. Glazing Seal: Silicone bedding, interior and exterior.
- E. Glazing Option: STC/OITC upgrade.

2.5 FINISH

- A. Exterior: Factory applied finish.
 - 1. Color: Stone Whit
- B. Interior: White interior factory finish.

2.6 HARDWARE

- A. Hinges: 4 inch butt hinges that contain both horizontal and vertical adjustment feature. Three hinges on panel height of 65 and 68. Four hinges are used on panel heights of 80.
 - 1. Finish: Powder coated, gold tone, or optional powder coated white, gray and dark brown
- B. Handle Set: Lever operated.
 - 1. Finish: Almond Frost; White; Solid Brass; Satin Nickel; Oil Rubbed Bronze.
- C. Locking System: Multi-point locking system. Stainless steel passage latch, head and foot bolts operated from lever set. Top and bottom shoot bolt are operated by the handle set. The interior and exterior are the same color.

2.7 WEATHER STRIP

- A. Weather strip is beige in color. All units are constructed with weather strip at all panel perimeter joints. Jambs, head jamb, astragal, and mull post utilize a foam leaf type weather strip. Santoprene sill weather strip to seal against the bottom rail and panel drip. Bottom rail utilizes a rigid panel drip. Interlocks use full length leaf style weather strip.

2.8 JAMB EXTENSION

- A. Furnish jamb extension 6-9/16 (167 mm) factory installed; 6-13/16 (160 mm) shipped loose. Jamb extensions add 1/4" to width and 1/8" to height of Rough Opening.
- B. Finish: White interior factory finish.

2.9 SIMULATED DIVIDED LITES (SDL)

- A. 7/8" (22 mm) wide. Available with optional SDL internal spacer bar.
 - 1. Exterior muntins: Extruded Ultrex. Rectangular.
 - a. Color: Stone White
 - 2. Interior muntins: White interior factory finish.

2.10 ACCESSORIES AND TRIM

- A. Exterior Casing:
 - 1. Non-integral to the unit. Fastened to the exterior wall with barb and kerf.
 - 2. 2" Brick Mould available as a header and jamb surround.
 - 3. 3 1/2" Flat Casing available as a header and jamb surround.
 - 4. Color: Stone White
- B. Installation Accessories:
 - 1. Factory installed nailing fin at head and side jambs.
 - 2. Installation Brackets: 6-3/8 inches (162 mm); 9-3/8 inches (238 mm); 15-3/8 inches (390 mm).
 - 3. Mullion kit: Mullion kit for field assembly of units. Kit includes: Instructions, aluminum pins, mullion tie, sealant foam tape, masonry clips, mull brackets, #7 x 3/4 inch installation bracket screws, #8 x 3/8 inch screws, interior mullion trim, and nailing fin connectors.
 - 4. Installation clips standard with nailing fin on impact glazed units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Before Installation, verify openings are plumb, square, and of proper dimension. Report frame defects or unsuitable conditions to the General Contractor before proceeding.

- B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

3.2 INSTALLATION

- A. Assemble and install doors and frames according to manufacturer's instructions and reviewed shop drawings.
- B. Set door sills in full bed of sealant, install backing material and sealant at head and side jambs. Do not use expansive foam sealant.
- C. Install frames and stationary panels as required.
- D. Install sill support before using door.
- E. Install accessory items as required.
- F. Use finish nails to apply wood trim and moldings.

3.3 STARTING AND ADJUSTING

- A. Adjust door to work freely with hardware functioning properly. Re-adjust at completion of project if directed.

3.4 CLEANING

- A. Remove visible labels and adhesive residue according to manufacturer's instructions.
- B. Leave doors and glass in a clean condition.

3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Cover doors and frames during painting or other construction operations that may cause damage.
- B. Protect sill from damage by chemicals, solvents, paint, or construction traffic.

END OF SECTION

SECTION 09111 - NON-LOAD-BEARING STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645.[
 - 1. Steel Studs and Runners:

- a. Minimum Base-Metal Thickness: 0.027 inch (0.68 mm).
 - b. Depth: As indicated on Drawings.
- C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
 - 2. Depth: As indicated on Drawings.
- D. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.
- E. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor.
 - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
 - 1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.027 inch (0.68 mm).
 - b. Depth: As indicated on Drawings.
 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
 - a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
 4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Grid System.
 - c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive

materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

2. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches (1219 mm) o.c.
 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
 3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.
 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09111

SECTION 09220 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Exterior portland cement plasterwork (stucco): scratch and brown with fiber.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of colored and textured finish coat indicated; 12 by 12 inches (305 by 305 mm), and prepared on rigid backing.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For portland cement plaster assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork: Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C). Do not apply when freezing temperatures are anticipated within 24 hours.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, new, unopened packages and containers bearing manufacturer's name and label.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 40 deg F (4.4 deg C). Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue. Do not store longer than 6 months before final use.
 - 1. Protect cementitious coating materials from freezing. Keep materials dry and off of the ground. Keep storage area neat and orderly. Remove waste daily. Take necessary measures to ensure that workers and work areas are protected from health hazards resulting from handling, mixing, and applying the coating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Magna Wall® Scratch and Brown Stucco with Fiber.

Magna Wall
5014 Callaghan Road
San Antonio, TX 78228
Phone: 800.626.4391
www.magnawall.com

- B. Other manufacturer's product. Any alternative product must meet all specifications as outlined and be approved by the Architect or Designer prior to bidding.

2.2 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.

1. Diamond-Mesh Lath: Self-furring.

a. Weight: 2.5 lb/sq. yd. (1.4 kg/sq. m)

- B. Paper Backing: FS UU-B-790, Type I Grade D, Style 2 vapor-permeable paper or Grade B, Style 1a vapor-retardant paper

1. Provide paper-backed lath unless otherwise indicated.

2. Not less than two layers of weather resistant barrier shall be applied over wood sheathing.

2.3 ACCESSORIES

- A. General: coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

- B. Zinc and Zinc-Coated (Galvanized) Accessories:

1. Foundation Weep Screed: Fabricated from hot-dip galvanized steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.
2. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
3. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
4. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.
5. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
6. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

7. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
8. Two-Piece Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4-to-5/8-inch (6.34-to-16-mm) wide; with perforated flanges.

C. Plastic Trim: Fabricated from high-impact PVC.

1. Cornerbeads: With perforated flanges.
2. Casing Beads: With perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.
3. Control Joints: One-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
4. Expansion Joints: Two-piece type, formed to produce slip-joint and square-edged 1/2-inch- (13-mm-) wide reveal; with perforated concealed flanges.

2.4 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Magna Wall® Scratch & Brown Stucco with Fiber uses ultra fine polypropylene fibers. These fibers lie down for easier finishing and are nearly invisible in the mixed or finished stucco. Any alternative product must use polypropylene fibers, 1/2 inch (13 mm) long, with a diameter not greater than 7 denier, free of contaminants, manufactured for use in portland cement plaster.
- C. Sand: If Legacy Report NER-459 is used, sand must comply with ASTM C 144 (masonry sand). If ICBO Report ER 4776 is used, sand must comply with either ASTM C 144 (masonry sand) or to ASTM C 897 (plaster sand).
- D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of not fewer than three exposed threads.
- E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- F. Isolation Strip at Exterior Walls:
 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), unperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.1 mm) thick, in width to suit steel stud size.

2.5 PLASTER MATERIALS

- A. Magna Wall® Scratch and Brown Stucco with Fiber. Any alternative product must be covered by an evaluation report, and be a mill-mixed blend of Portland cement, high-performance pozzolan, hydrated lime, and fiber. It must also comply to the following specifications:

1. Water Retention: Exceed ASTM C 1328. Minimum 80%
2. Air Content: Exceed ASTM C 1328. Maintain 12%-16%
3. Compressive Strength: Exceed ASTM C 1328. 7 day compressive strength of 1500 psi. 28 day compressive strength of 2200 psi. 90 day compressive strength of 2700 psi.
4. Time of Setting: Exceed ASTM C 1328. Initial set not less than 100 minutes. Final set no longer than 240 minutes.
5. Autoclave Expansion: Exceed ASTM C 1328. Not more than 0.05%
6. Fineness: Exceed ASTM C 1328. Not more than 18%

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Mix Magna Wall® Scratch and Brown Stucco with Fiber according to manufacturer's product instructions. View MSDS in order to understand and comply to all warnings.
- C. Do not add air-entraining agents, mortar fat, accelerators, or waterproofing agents, as they may interfere with the chemical integrity of the product.

3.2 INSTALLATION, GENERAL

- A. Sound Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.
- B. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.
- C. ICBO Report ER 4776 and ICC Legacy Report NER-459 must be complied with if Magna Wall® Scratch and Brown is used as a One-Coat Stucco.

3.3 INSTALLING METAL LATH

- A. Expanded-Metal Lath: Install according to ASTM C 1063 and at locations indicated on Drawings.

3.4 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:

1. Install lath-type external-corner reinforcement at exterior locations.
 2. Install cornerbead at interior locations.
- C. Control Joints: Install control joints in specific locations approved by Architect.
1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
 - b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
 2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.
 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
 4. Where control joints occur in surface of construction directly behind plaster.
 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.5 PLASTER APPLICATION

- A. Apply the scratch coat a minimum 3/8-inch thick, and allow the scratch coat to cure sufficiently.
- B. Delay application of the brown coat for 48 hours in order to reduce the number of hairline cracks in the stucco.
- C. Apply the brown coat a minimum of 3/8-inch thick.
- D. Moist cure for 48 hours with regular fogging spray after stucco has taken its initial set (2 – 4 hours).
- E. Plaster Finish Coats: Apply to provide texture as selected by Architect or Designer. Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

3.6 CUTTING AND PATCHING

- A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing (check cracking), dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION 09220

SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Interior gypsum board.
- 2. Tile backing panels.
- 3. Texture finishes.

- B. Related Requirements:

- 1. Section 06160 "Sheathing" for gypsum sheathing for exterior walls.
- 2. Section 09111 "Non-Load-Bearing Steel Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. CertainTeed Corp.
 2. Georgia-Pacific Gypsum LLC.
 3. National Gypsum Company.
 4. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 1. Thickness: 5/8 inch (15.9 mm).
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 1. Thickness: 5/8 inch (15.9 mm).
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 1. Thickness: 1/2 inch (12.7 mm).
 2. Long Edges: Tapered.
- E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: [As indicated] [1/2 inch (12.7 mm), regular type] [5/8 inch (15.9 mm), Type X].
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide the following:
 - a. James Hardie Building Products, Inc.; Hardiebacker 500.
2. Thickness: 5/8 inch (15.9 mm).
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.

- B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

- a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Pecora Corporation; AC-20 FTR or AIS-919.
 - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - e. USG Corporation; SHEETROCK Acoustical Sealant.
- E. Thermal Insulation: As specified in Section 07210 "Building Insulation."

2.8 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
- B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.
1. Products: Subject to compliance with requirements, provide one of the following:

- a. CertainTeed Corp.; ProRoc Easi-Tex Spray Texture.
 - b. National Gypsum Company; Perfect Spray EM Texture.
 - c. USG Corporation; BEADEx FasTex Wall and Ceiling Spray Texture.
2. Texture: Orange Peel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Ceiling Type: Ceiling surfaces.
 - 4. Moisture- and Mold-Resistant Type: Bathroom Ceilings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 - 1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and locations indicated to receive tile.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners[unless otherwise indicated].
 - 2. Bullnose Bead: Use [at outside corners] [where indicated] <Insert requirements>.
 - 3. LC-Bead: Use [at exposed panel edges] <Insert requirements>.
 - 4. L-Bead: Use [where indicated] <Insert requirements>.
 - 5. U-Bead: Use [at exposed panel edges] [where indicated] <Insert requirements>.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09900 "Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09250

SECTION 09265 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

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: Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: 2 hours.
- B. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated.
 - 2. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
- C. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches (51 mm) long and matching studs in depth.
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
- D. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.
- E. Room-Side Finish: Gypsum board.
- F. Shaft-Side Finish: Gypsum shaftliner board, Type X.
- G. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; ProRoc Shaftliner.
 - b. Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; ToughRock Fireguard Shaftliner.
 - c. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner.
 - d. USG Corporation; Sheetrock Brand Gypsum Liner Panel.

2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.

C. Gypsum Board: As specified in Section 09250 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120) unless otherwise indicated.

B. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
 - b. Grace Construction Products; FlameSafe FlowTrak System.
 - c. Metal-Lite, Inc.; The System.
 - d. Steel Network Inc. (The); VertiClip SLD of VertiTrack VTD Series.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09250 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

E. Sound Attenuation Blankets: As specified in Section 09250 "Gypsum Board."

- F. Acoustical Sealant: As specified in Section 09250 "Gypsum Board."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 07811 "Sprayed Fire-Resistive Materials."
- B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 - 1. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch (0.84-mm) minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration

and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
- H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
- I. Cant Panels: At projections into shaft exceeding 4 inches (102 mm), install 1/2- or 5/8-inch- (13- or 16-mm-) thick gypsum board cants covering tops of projections.
 - 1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches (610 mm) o.c. with screws fastened to shaft wall framing.
 - 2. Where steel framing is required to support gypsum board cants, install framing at 24 inches (610 mm) o.c. and extend studs from the projection to shaft wall framing.
- J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09265

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Ceramic tile
2. Waterproof membrane.
3. Crack isolation membrane.
4. Metal edge strips.

- B. Related Sections:

1. Section 09250 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.[
2. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.]
3. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least [12 inches (300 mm) square] <Insert size>, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
4. Full-size units of each type of trim and accessory[for each color and finish required].
5. Metal edge strips in 6-inch (150-mm) lengths.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Waterproof membrane.
 2. Crack isolation membrane.
 3. Joint sealants.
 4. Cementitious backer units.
 5. Metal edge strips.
- D. Preinstallation Conference: Conduct conference at Project site.
1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in swimming pools, on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. Products: See drawings for tile selections

2.3 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.203-mm) nominal thickness.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Schluter Systems L.P.; KERDI.

2.4 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.203-mm) nominal thickness.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Schluter Systems L.P.; KERDI.

2.5 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, products by one of the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. C-Cure.
 - d. Custom Building Products.
 - e. Jamo Inc.
 - f. Laticrete International, Inc.
 - g. MAPEI Corporation.
 - h. Mer-Kote Products, Inc.
 - i. Southern Grouts & Mortars, Inc.
 - j. Summitville Tiles, Inc.
 - k. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.

3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

B. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. C-Cure.
 - d. Custom Building Products.
 - e. Jamo Inc.
 - f. Laticrete International, Inc.
 - g. MAPEI Corporation.
 - h. Mer-Kote Products, Inc.
 - i. Southern Grouts & Mortars, Inc.
 - j. Summitville Tiles, Inc.
 - k. TEC; a subsidiary of H. B. Fuller Company.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.

2.6 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. C-Cure.
 - d. Custom Building Products.
 - e. Jamo Inc.
 - f. Laticrete International, Inc.
 - g. MAPEI Corporation.
 - h. Southern Grouts & Mortars, Inc.
 - i. Summitville Tiles, Inc.
 - j. TEC; a subsidiary of H. B. Fuller Company.
2. Polymer Type: Acrylic resin in liquid-latex form for addition to prepackaged dry-grout mix.

B. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Minerals & Chemicals, Inc.
 - b. Boiardi Products; a QEP company.

- c. Bonsal American; an Oldcastle company.
 - d. Bostik, Inc.
 - e. C-Cure.
 - f. Custom Building Products.
 - g. Jamo Inc.
 - h. Laticrete International, Inc.
 - i. MAPEI Corporation.
 - j. Mer-Kote Products, Inc.
 - k. Southern Grouts & Mortars, Inc.
 - l. Summitville Tiles, Inc.
 - m. TEC; a subsidiary of H. B. Fuller Company.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07920 "Joint Sealants."

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver exposed-edge material.
- C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with adhesives or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - f. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
 - 2. Paver Tile: 1/4 inch (6.35 mm).
 - 3. Glazed Wall Tile: 1/16 inch (1.6 mm).
 - 4. Decorative Thin Wall Tile: 1/16 inch (1.6 mm).

- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 07920 "Joint Sealants."

- H. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

- I. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

- A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.[

- B. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.]

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation F113: Thin-set mortar; TCA F113A-11.
 - a. Tile Type: As Indicated on Drawings for each location.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Polymer-modified unsanded grout.
 - 2. Tile Installation F122: Thin-set mortar on waterproof membrane; TCA F122A-11.
 - a. Tile Type: As indicated on drawings for each location.
 - b. Thin-Set Mortar: Latex-portland cement mortar.
 - c. Grout: Polymer-modified unsanded grout.

B. Interior Wall Installations, Studs or Furring:

1. Tile Installation W244: Thin-set mortar on cementitious backer units or fiber cement underlayment; TCA W244.
 - a. Tile Type: As indicated on drawings for each location.
 - b. Thin-Set Mortar: Latex-portland cement mortar.
 - c. Grout: Polymer-modified unsanded grout.

END OF SECTION 09310

SECTION 09651- VINYL PLANK FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Vinyl Plank Flooring.
- B. Accessories.

1.2 REFERENCES

- A. European Standard EN 427 - Resilient floor coverings. Determination of the side length, squareness and straightness of tiles.
- B. European Standard EN 433 - Resilient floor coverings. Determination of residual indentation after static loading.
- C. European Standard EN 434 - Resilient floor coverings - Determination of dimensional stability and curling after exposure to heat.
- D. European Standard EN 660 - Resilient floor coverings. Determination of wear resistance. Frick-Taber test.
- E. European Standard EN 685 - Resilient, textile and laminate floor coverings - Classification
- F. European Standard EN 13329 - Laminate floor coverings - Elements with a surface layer based on aminoplastic thermosetting resins - Specifications, requirements and test methods.
- G. European Standard ISO 105-B02 - Textiles; Tests for Color Fastness.
- H. NALFA/ANSI LF-01-2008 - Laminated Flooring Specifications and Test Methods.

1.3 PERFORMANCE REQUIREMENTS

- A. Properties: Vinyl plank flooring shall conform with the following:
 - 1. Squareness:
 - a. Test method: EN 427
 - b. Less than or equal to 0.20 mm.
 - 2. Straightness:
 - a. Test method: EN 427
 - b. Less than or equal to 0.30 mm.
 - 3. Residual Indentation - Average:
 - a. Test method: EN 433
 - b. Less than or equal to 0.1 mm.
 - 4. Dimensional Stability After Exposure to Heat:
 - a. Test method: EN 434
 - b. Less than or equal to 0.25 percent.
 - 5. Curling After Exposure to Heat:
 - a. Test method: EN 434
 - b. Less than or equal to 2 mm.
 - 6. Color Fastness to Artificial Light:
 - a. Test method: EN ISO 105-B02
 - b. 6 minimum.

7. Wear Group:
 - a. Test method: EN 660-2
 - b. Wear group T.
8. Classification:
 - a. Test method: EN 685C
 - b. Class 32/41.
9. Wear Resistance / Abrasion Resistance:
 - a. NALFA/ANSI LF-01-2008 3.7
 - b. IP greater than or equal to 4,000 cycles
10. Resistance to Staining:
 - a. Test method: EN 13329
 - b. 5 (groups 1 and 2), 4 (group 3)

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Installation details including location and layout of each type of flooring and accessory. Include layout data for each location with consideration for expansion control.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques, application workmanship and requirements for expansion control.
 1. Finish 10 feet by 10 feet (3 mm by 3 mm) area, including typical field and edge conditions.
 2. Locate in area designated by Architect.
 3. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 4. Refinish mock-up area as required to produce acceptable work.
 5. Maintain mock-up as a standard of quality for the work of this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials flat in a dry, warm, ventilated and weather tight location.
- D. Protect flooring products from damage.

1.7 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- 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.
- B. Spaces must be enclosed and dry with normal design humidity levels and temperatures between 55 and 85 degrees F (12 and 29 degrees C) for a minimum of 48 hours before, during and after installation of finished flooring. After installation, maintain design humidity and temperature levels.
- C. Store materials for not less than 24 hours prior to installation in area of installation at temperatures between 55 and 85 degrees F (12 and 29 degrees C) to achieve temperature stability.

1.9 WARRANTY

- A. Provide manufacturer's standard 25 year limited residential warranty against tear, fade, stain, separation, discolor, gap, and edge curl and lifetime limited warranty against wear-through
- B. Provide manufacturer's standard 5 year limited light commercial warranty against wear-through.

1.10 EXTRA MATERIALS

- A. Deliver 10 percent of each type and color specified for Owner's use in maintenance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Pergo, LLC - Builder Division, which is located at: 2000 Pergo Pkwy. ; Garner, NC 27529; Toll Free Tel: 800-252-3121; Fax: 800-251-8782
- B. Or prior approved equal.

2.2 COMPONENTS

- A. Vinyl Plank: Luxury Vinyl Planks:
 - 1. Exposed Surface Size: 5.91 inches wide by 36.85 inches long (150 mm wide by 936 mm long).
 - 2. Thickness: 0.157 inches (4.0 mm) including wear layer.
 - 3. Plank Bevel: Four sides.
 - 4. Clear Wear Layer Thickness: 0.5 mm.
 - 5. Top Coat: Acrylic urethane lacquer.
 - 6. Joint Type: Interlocking type on all sides.
 - 7. Color/Pattern:
- B. Accessories:
 - 1. Flooring Spacers: Maintain spacing between flooring and walls or other perimeter vertical surfaces.
 - 2. Silicone Sealant: Use 100 percent silicone sealant to seal gaps, around metal door frames and flooring edges and in areas where moisture may be present.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared in accordance with manufacturer's instructions.
- B. Verify that surfaces to receive vinyl plank flooring are smooth, flat and sound.
- C. Verify new concrete slabs and substrates are completely cured for a minimum of 6 weeks prior to installation.
- D. Verify wood subfloor is properly secured, smooth and flat. All dimples due to nails and seams must be filled.
- E. Verify required floor mounted utilities are in proper location.
- F. Verify vinyl plank flooring has been acclimated to ambient temperatures, and acclimation and ambient temperatures are in accordance with manufacturer's instructions.
- G. 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.
- B. Concrete slabs: Grind high spots and fill low spots to provide a maximum 1/16 inch (2 mm) deviation in any direction when checked with a 3 foot (0.9 m) straight edge.
- C. Wood Subfloors: Fill voids to provide a maximum 1/16 inch (2 mm) deviation in any direction when checked with a 3 foot (0.9 m) straight edge.
- D. Vinyl Substrate: Verify vinyl is tightly fastened to subfloor. Vinyl shall be smooth, flat and clean. Fill voids to provide a maximum 1/16 inch (2 mm) deviation in any direction when checked with a 3 foot (0.9 m) straight edge.
- E. Remove wood floors on concrete subfloor prior to installation.
- F. Remove carpeting on subfloor prior to installation.

- G. If a leveling compound is used to level subfloor, material must be fully cured and dry as specified for the applicable substrate prior to starting installation.
- H. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- I. Allow unopened cartons of planks to remain in the room where they are to be installed at least 24 hours prior to installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install flooring planks parallel to the long direction of the room. Verify strip flooring direction with Architect before starting installation.
- C. Install flooring symmetrically about room centerline unless otherwise indicated. Lay planks from left to right.
- D. Stagger end joint locations a minimum of 6 inches (150 mm).
- E. Fit flooring neatly to vertical interruptions. Follow shape of interrupting item when joint will remain exposed and maintain 5/16 inch (8 mm) expansion space.
- F. Install divider strips where flooring terminates at centerline of doors and adjacent to other materials or unfinished floor areas.
- G. Door Frames:
 - 1. Undercut wood door frames and allow for 5/16 inch minimum (8 mm) expansion clearance.
 - 2. Do not undercut metal door frames, cut floor planks to fit around frames. Provide 5/16 inch (8 mm) expansion space and fill with color-matched perimeter sealant.
 - 3. Provide transitions at interior metal door applications.
- H. Pipe Holes, Fixture Bolts, Fixture Anchors, Pillars, Fixed Objects:
 - 1. Drill a hole in the flooring 5/8 inch (8 mm) larger than the pipe/anchor diameter to allow for movement.
- I. Molding and Trim:
 - 1. Install moldings and trim in accordance with manufacturer's instructions.
 - 2. Adhere molding with construction mastic and/or mechanical when joining another flooring material.

3.4 CLEANING

- A. Remove excess sealant from floor, base, and wall surfaces without damage.
- B. Clean and maintain resilient flooring products in accordance with manufacturer's instructions.

3.5 PROTECTION

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

END OF SECTION

SECTION 09680 - CARPETING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sheet carpet.
 - 2. Carpet pad.
- B. Related Sections:
 - 1. Division 01: Administrative, procedural, and temporary work requirements.
- C. Allowances:
 - 1. Include a unit cost allowance of \$13 per square yard for carpet and pad.
 - 2. Installation is included in amount of allowance.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. D2859 - Standard Test Method for Flammability of Finished Textile Floor Covering Materials.
 - 2. D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
 - 3. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. E648 - Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
 - 5. E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
 - 6. F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- B. Carpet and Rug Institute (CRI):
 - 1. 104 - Standard for Installation of Commercial Carpet.
 - 2. 105 - Standard for Installation of Residential Carpet.
 - 3. Indoor Air Quality Testing Program.
- C. National Fire Protection Association (NFPA) 253 - Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.3 SUBMITTALS

- A. Submittals for Review:
 - 1. Shop Drawings: Indicate carpet locations, dye lot limitations, seaming plan, method of joining seams, direction of carpet in each room or area, and type and location of edgings.
 - 2. Samples:
 - a. Carpet: 36 inch x 36 inch samples showing available colors.
 - b. Carpet pad: 36 inch x 36 inch samples.
- B. Quality Control Submittals:
 - 1. Certificates of Compliance: Certification from an independent testing laboratory that carpet meets fire hazard classification requirements.

1.4 QUALITY ASSURANCE

- A. Fire Hazard Classification: Maximum flame spread/smoke developed rating of 75/125, tested to ASTM E84.
- B. Mockup:
 - 1. Size: Minimum 12 x 12 feet.
 - 2. Show: Carpet color and pattern, seams, and edgings.
 - 3. Locate where directed.
 - 4. Approved mockup may remain as part of the Work.
- C. Pre-Installation Conference:
 - 1. Convene at site 2 weeks prior to beginning work of this Section.
 - 2. Review and discuss: Contract Documents, carpet manufacturer's literature, project conditions, scheduling, protection after installation, and other matters affecting application.

1.5 PROJECT CONDITIONS

- A. Do not begin installation until painting and finishing work have been completed.
- B. Environmental Requirements:
 - 1. Temperature of spaces and subfloor between 65 and 90 degrees F.
 - 2. Humidity in spaces to receive carpet between 20 and 65 percent.

1.6 WARRANTIES

- A. Furnish manufacturer's 5 year warranty providing coverage against defective materials and workmanship.

1.7 MAINTENANCE

- A. Extra Materials: 5 percent of each color and pattern.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers - Carpet:
 - 1. Bigelow Commercial Carpet. (www.bigelowcommercial.com)
 - 2. Karastan Contract. (www.karastan.com)
 - 3. Mohawk International (www.mohawkinternational.com)
 - 4. Shaw Contract. (www.shawcontract.com)
- B. Acceptable Manufacturers - Carpet Pad:
 - 1. ER Carpenter Co. (www.carpenter.com)
 - 2. Sponge-Cushion Inc. (www.sponge-cushion.com)
- C. Substitutions: [Under provisions of Division 01.] [Not permitted.]

2.2 MATERIALS

- A. Carpet: To be selected under an allowance.

2.3 ACCESSORIES

- A. Seaming Materials: As recommended by carpet manufacturer.

- B. Adhesive:
 - 1. Waterproof, latex based cement formulated specifically for installing carpet; recommended by carpet manufacturer.
- C. Carpet Pad: Rebonded polyurethane, 3/8 inch thick, 6 PCF density.
- D. Gripper Strip: As recommended by carpet manufacturer for carpet thickness, water resistant plywood with angular pins.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that concrete floors have cured a minimum 28 days and do not exhibit negative alkalinity, carbonization, or dusting.

3.2 PREPARATION

- A. Clean substrate; remove loose and foreign matter that could impede adhesion or performance of flooring.
- B. Fill cracks, voids, and depressions with leveling compound.
- C. Grind ridges and high spots smooth.
- D. Test substrate for moisture content to ASTM F1869; do not install carpet until moisture emission level is acceptable to carpet manufacturer.

3.3 INSTALLATION OF CARPET

- A. Install in accordance with CRI 105.
- B. Install carpet and pad in accordance with manufacturer's instructions.
- C. Lay out carpet so that seams will be minimized and as inconspicuous as possible.
- D. Longitudinal seams not permitted where width of room or space is less than width of carpet.
- E. Do not change run of pile in any room where carpet is continued through a wall opening into another room.
- F. Verify carpet match before cutting to ensure minimal variation between dye lots.
- G. Install gripper strip at perimeter and around abutting objects. Secure to subfloor.
- H. Install pad using maximum size pieces. Butt edges together and tight to gripper strip. Remove air pockets and wrinkles; tape joints with 2 inch wide waterproof tape. Secure to substrate by spot adhesive method.
- I. Stretch carpet according to manufacturer's instructions for percentage of stretch.

- J. Fasten carpet securely to strips so that all pins penetrate carpet backing. Tuck raw edges behind strips.
- K. Join seams with hot seaming tape. Form seams straight and free of peaks or gaps.
- L. Lay carpet tight and flat on pad, well fastened at edges, with uniform appearance. Provide monolithic color, pattern, and texture match within any one room or area.
- M. Fit carpet tight to abutting surfaces and penetrations without gaps. Ensure coverage of carpet edges by wall base, trim, escutcheons, and cover plates.
- N. Provide monolithic color, pattern, and texture within each area.

3.4 INSTALLATION OF EDGINGS

- A. Install strips where carpet abuts dissimilar flooring materials; secure to subfloor.
- B. Center strips under doors where carpet terminates at door openings.
- C. Install in longest practical lengths; butt ends tight.
- D. Scribe to abutting surfaces.

3.5 CLEANING

- A. Clean spots as recommended by carpet manufacturer.
- B. Cut off loose threads flush with top surface.
- C. Clean with commercial vacuum cleaner.

END OF SECTION

SECTION 09900 - HIGH-PERFORMANCE COATINGS

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. Surface preparation, painting, and finishing of exposed interior and exterior items and surfaces. Surface preparation, priming, and finish coats specified in this section are in addition to shop-priming and surface treatments specified in other sections (i.e. structural steel primer and hollow metal doors and frames).

b. Paint all exposed surfaces whether or not colors are designated in the schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Owner and Architect will select from standard colors or finishes available.

c. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, and labels. Do not paint over Underwriters Laboratories, Factory Mutual, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 SUBMITTALS

- A. Product Data: For each coating system indicated. Include block fillers and primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
 - 1. After color selection, Architect will furnish color chips for surfaces to be coated.

- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
 - 1. Provide stepped Samples defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. List of material and application for each coat of each sample. Label each sample for location and application.
 - 3. Submit samples on the following substrates for Architect's review of color and texture:
 - a. Concrete Masonry: Provide two 8-inch- (200-mm-) square samples of masonry, with mortar joint in the center, for each finish and color.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
- B. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required. Duplicate finish of approved sample Submittals.
 - 1. Architect will select one room, area, or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m) of wall surface.
 - b. Small Areas and Items: Architect will designate items or areas required.
 - 2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface as specified. Provide the required sheen, color, and texture of each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
 - 3. Final approval of colors will be from benchmark samples.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
 - 1. Name or title of material.
 - 2. Product description (generic classification or binder type).

3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. Handling instructions and precautions.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.6 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 and 95 deg F (7 and 35 deg C).
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products indicated in the coating system descriptions.
- B. Manufacturers' Names: The following manufacturers are referred to in the coating system descriptions by shortened versions of their names shown in parenthesis:
1. Sherwin Williams (S-W).

2.2 COATINGS MATERIALS, GENERAL

- A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not acceptable.

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

2.3 COLORS

- A. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.
 1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
 2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.
- B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
 1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
 - a. Confirmation of primer's suitability for expected service conditions.
 - b. Confirmation of primer's ability to be top coated with materials specified.
 2. Notify Architect about anticipated problems before using the coatings specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- B. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
1. Cementitious Substrates: Prepare concrete, brick, concrete masonry block, and cement plaster surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
 - a. Use abrasive blast-cleaning methods if recommended by coating manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
- D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
 2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
 3. Use only the type of thinners approved by manufacturer and only within recommended limits.

3.3 APPLICATION

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

- b. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
 1. The number of coats and film thickness required is the same regardless of application method.
 - a. Omit primer on metal surfaces that have been shop primed and touchup painted.
 - b. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 - c. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
 - d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
 2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
- C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
 - a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
 - b. Brush out and work brush coats into surfaces in an even film.
 - c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
 3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
 - a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
 - b. Apply each coat to provide the equivalent hiding of brush-applied coats.
 - c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.

- D. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- F. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 CLEANING

- A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
 - 1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
 - 2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 Paint Schedule: Provide the following paint systems for the various substrates indicated:

- 1. Exterior Iron: Surface Prep: SW14 or SW15
Primer:(1 coat) Kem Kromik Universal Metal Primer.
Two Coats: Industrial Urethane Alkyd Enamel
- 2. Exterior Metal Doors/Frames:
Surface Prep: SW14 or SW15
Primer:(1 coat) Kem Kromik Universal Metal Primer.
Two Coats: Industrial Urethane Alkyd Enamel.
- 3. Exterior Fiber Cement:
Surface Prep: SW14 or SW15
Primer:(1 coat)Loxon Masonry Primer
Two Coats: A-100 Exterior Latex
- 3) All Interior Wall Surfaces (excluding masonry):

Surface Prep: SW 8 or SW 12
Primer: (1 coat) Prep Rite 200 Latex primer
Two Coats: ProMar 700 Latex Enamel - Satin

- 4) Interior Drywall - Ceilings:
Surface Prep: SW 8 or SW 12
Primer: (1 coat) Prep Rite 200 Latex primer
Two Coats: ProMar 700 Latex Enamel - Satin
- 5) Interior Metal:
Surface Prep: SW 15 or SW 12
Primer: (1 coat) Kem Kromik Universal Metal Primer.
Two Coats: Industrial Urethane Alkyd Enamel.
- 6) Exterior Wood:
Surface Prep: SW 23 or SW 12.
Primer: (1 coat) A-100 Exterior Latex Wood Primer (2.3 mils)
Two Coats: A-100 Exterior Latex
- 8) Exterior and Interior Masonry:
Surface Prep: SW Heavy Duty Block Filler
First Coat: SW Loxon Exterior Acrylic Masonry Primer, A24W300
Second Coat: Water Based Catalyzed Epoxy
Third Coat: Water Based Catalyzed Epoxy

Note: Refer to Finish Schedule for a complete list of accent colors.

END OF SECTION 09900

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers. Include one fire extinguisher in each unit beneath the sink.
 - 2. Fire-protection cabinets for portable fire extinguishers.
 - 3. Mounting brackets for fire extinguishers.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide extinguishers listed and labeled by FM.

1.5 COORDINATION

- A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated and provided by Owner under separate Contract are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following manufacturers:
 - 1. Portable Fire Extinguishers:
 - a. J.L. Industries, Inc.
 - b. Larsen's Manufacturing Company.
 - c. Potter-Roemer; Div. of Smith Industries, Inc.
 - 2. Fire-Protection Cabinets:
 - a. J.L. Industries, Inc.
 - b. Larsen's Manufacturing Company.
 - c. Potter-Roemer; Div. of Smith Industries, Inc.
 - 3. Mounting Brackets
 - a. JL Industries, Inc.
 - b. Larsen's Manufacturing Company.
 - c. Potter Roemer; Div. of Smith Industries, Inc.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Multipurpose Dry-Chemical Type: UL-rated 2-A:10:B:C, 5-lb (2.3-kg) nominal capacity, in enameled-steel container.
- C. Purple-K Dry-Chemical Type in Aluminum Container (in kitchen area only): UL-rated 30-B:C, 5-lb (2.3-kg) nominal capacity, with potassium bicarbonate-based dry chemical in enameled-aluminum container.

2.4 FIRE-PROTECTION CABINETS

- A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
 - 1. Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E 814 for fire-resistance rating of wall where it is installed.
 - a. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.
 - b. Provide factory-drilled mounting holes.
 - 2. Cabinet Metal: Enameled-steel sheet.
- B. Cabinet Type: Suitable for the following:
 - 1. Fire extinguisher.
- C. Cabinet Mounting: Suitable for the following mounting conditions:
 - 1. Semirecessed (Typical): Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.

- D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
 - 1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.
- E. Cabinet Trim Material: Manufacturer's standard, as follows:
 - 1. Same metal and finish as door.
- F. Door Material: Manufacturer's standard, as follows:
 - 1. Steel sheet.
- G. Door Style: Manufacturer's standard design, as follows:
- H. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
 - 1. Provide minimum 1/2-inch- (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
- I. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.5 COLORS AND TEXTURES

- A. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:
 - 1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
 - 2. Interior of cabinets and doors.

2.7 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

- B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.8 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 1. Color: Red.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: As approved by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
 - 2. Fasten cabinets to structure, square and plumb.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust cabinet doors that do not swing or operate freely. Refinish or replace cabinets and doors damaged during installation.
- B. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10520

SECTION 10800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Private-use bathroom accessories.
 - 3. Underlavatory guards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. See Editing Instruction No.1 in the Evaluations for cautions about naming manufacturers. Retain one of first two paragraphs and list of manufacturers below. See Section 01600 "Product Requirements."
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
 - 6. Tubular Specialties Manufacturing, Inc.

2.3 PRIVATE-USE BATHROOM ACCESSORIES

- A. See Editing Instruction No.1 in the Evaluations for cautions about naming manufacturers. Retain one of first two paragraphs and list of manufacturers below. See Section 01600 "Product Requirements."
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Basco, Inc.
 - 2. Bobrick Washroom Equipment, Inc.
 - 3. Franklin Brass by Liberty Hardware Manufacturing Corporation; a Masco company.
 - 4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
 - 5. Ginger; a Masco company.
 - 6. Seachrome Corporation.
 - 7. Tubular Specialties Manufacturing, Inc.

2.4 UNDERLAVATORY GUARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Plumberex Specialty Products, Inc.
 - 2. Truebro by IPS Corporation.
 - 3. <Insert manufacturer's name>.
- B. Underlavatory Guard at all exposed piping at countertops and wall hung lavatories:
 - 1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
 - 2. Material and Finish: Antimicrobial, molded plastic, white.

2.5 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10800

SECTION 11452 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes the following types of residential appliances furnished & installed by the GC

- Cooking equipment, including ranges and ovens.
- Refrigerator/freezers.
- Dishwashers.
- Microwave Ovens
- Washer / Dryers

Related Sections: The following sections contain requirements that relate to this Section:

- Plumbing connections for appliances are specified in Division 15.
- Electrical services and connections for appliances are specified in Division 16.

QUALITY ASSURANCE

UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and comply with applicable NEMA standards. Appliances must also conform to local electrical standards.

DELIVERY AND STORAGE

Delivery of appliances to the Project site will be in manufacturer's undamaged protective packaging.

Contractor shall coordinate delivery of appliances until utility rough-in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

PART 2 - PRODUCTS

MANUFACTURERS

Manufacturers: Subject to compliance with requirements, Contractor is to provide appliances. See drawings for appliances, manufacturers and model numbers.

PART 3 - EXECUTION

INSTALLATION

General: Comply with manufacturer's instructions and recommendations.

Built-In Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

Utilities: Refer to Divisions 15 and 16 for plumbing and electrical requirements.

ADJUST AND CLEAN

Testing: Test each item of residential equipment to verify proper operation. Make necessary adjustments.

Accessories: Verify that accessory items required have been furnished and installed.

Cleaning: Remove and legally dispose of packing material from residential equipment items and leave units in clean condition, ready for operation.

END OF SECTION 11452

SECTION 12356 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes kitchen and vanity cabinets.
- B. Related Requirements:
 - 1. Section 06415 "Stone Countertops."

1.3 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. Exposed Surfaces of Cabinets: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.
- C. Semiexposed Surfaces of Cabinets: Surfaces behind opaque doors or drawer fronts, including interior faces of doors, interiors and sides of drawers, and bottoms of wall cabinets.
- D. Concealed Surfaces of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, ends of cabinets installed directly against and completely concealed by walls or other cabinets, and tops of wall cabinets and utility cabinets.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Cabinets.
 - 2. Cabinet hardware.
- B. Shop Drawings: Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, and hardware.
- C. Samples: For cabinet finishes.
- D. Samples for Initial Selection: For cabinet finishes.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete and dry, and temporary HVAC system is operating and maintaining temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.

1.6 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.

PART 2 - PRODUCTS

2.1 CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Woodmont Cabinetry
 - 2. Prior approve equals.
- B. Quality Standard: Provide cabinets that comply with KCMA A161.1.
 - 1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.
- C. Face Style: Flush overlay; door and drawer faces cover cabinet fronts with only enough space between faces for operating clearance.
- D. Face Style: Flush inset; door and drawer faces are set within cabinet fronts, flush with faces.
- E. Cabinet Style: Frameless.
- F. Door and Drawer Fronts: 1/2-inch- (12.7-mm-) thick, veneer-faced plywood.
- G. Exposed Cabinet End Finish: Wood veneer.
- H. Cabinet End Construction: 5/8-inch- (16-mm-) thick particleboard or 1/2-inch- (12.7-mm-) thick plywood.

- I. Cabinet Tops and Bottoms: 5/8-inch- (16-mm-) thick particleboard or 1/2-inch- (12.7-mm-) thick plywood, fully supported by and secured in rabbets in end panels and back rail.
- J. Back, Top, and Bottom Rails: 3/4-by-2-1/2-inch (19-by-63-mm) solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.
- K. Wall-Hung-Unit Back Panels: 3/16-inch- (4.8-mm-) thick plywood fastened to rear edge of end panels and to top and bottom rails.
- L. Base-Unit Back Panels: 3/16-inch- (4.8-mm-) thick plywood fastened to rear edge of end panels and to top and bottom rails.
- M. Front Frame Drawer Rails: 3/4-by-1-1/4-inch (19-by-32-mm) solid wood mortised and fastened into face frame.
- N. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
 - 2. Subfronts, Backs, and Sides: 1/2-inch- (12.7-mm-) thick solid wood or 3/8-inch- (9.5-mm-) thick plywood.
 - 3. Bottoms: 1/4-inch- (6.4-mm-) thick plywood.
 - 4. Bottoms: 1/4-inch- (6.4-mm-) thick hardboard.
- O. Shelves: 3/4-inch- (19-mm-) thick particleboard or 5/8-inch- (16-mm-) thick plywood.
- P. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.
- Q. Factory Finishing: Finish cabinets at factory. Defer only final touchup until after installation.

2.2 CABINET MATERIALS

- A. General:
 - 1. Hardwood Lumber: Kiln dried to 7 percent moisture content.
 - 2. Softwood Lumber: Kiln dried to 10 percent moisture content.
 - 3. Hardwood Plywood: HPVA HP-1.
 - 4. Particleboard: ANSI A208.1, Grade M-2.
 - 5. MDF: ANSI A208.2, Grade MD made with binder containing no urea formaldehyde.
 - 6. Hardboard: ANSI A135.4, Class 1 Tempered.
- B. Exposed Materials:

1. Exposed Wood Species: Maple (Quartersawn).
 - a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.
 - b. Staining and Finish: As selected by Architect from manufacturer's full range.
 2. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
 3. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.
 - a. Edge band exposed edges with a minimum of 1/8-inch- (3-mm-) thick, solid-veneer edging of same species as face veneer.
- C. Semiexposed Materials: Unless otherwise indicated, provide the following:
1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects. Same species as exposed surfaces or stained to be compatible with exposed surfaces.
 2. Plywood: Hardwood plywood with Grade C faces and not less than Grade 3 backs of same species as faces. Face veneers of same species as exposed surfaces or stained to be compatible with exposed surfaces.
- D. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; MDF; or hardboard.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.
- B. Pulls: Back-mounted decorative pulls. Kraftmaid; Bridge Collection; 5 inch Center Pull; Satin Chrome finish.
- C. Hinges: Concealed European-style, self-closing hinges.
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or Type B05091.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.
- C. Install cabinets level and plumb to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).
- D. Fasten cabinets to adjacent units and to backing.
 - 1. 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.

3.3 ADJUSTING AND CLEANING

- A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 12356

SECTION 14240 - HYDRAULIC ELEVATORS

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 holeless hydraulic passenger elevators.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1 apply to work of this Section.
- B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.4 SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:
 - 1. Car enclosures and hoistway entrances.
 - 2. Operation, control, and signal systems.
- B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control station and standby power operation control panel. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples for Initial Selection: For finishes involving color selection.
- D. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- (75-mm-) square Samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.
- E. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- F. Qualification Data: For Installer.

- G. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
- H. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- I. Warranty: Special warranty specified in this Section.
- J. Continuing Maintenance Proposal: Service agreement specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain elevators through one source from a single manufacturer.
 - 1. Provide major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.
- C. Regulatory Requirements: Comply with ASME A17.1 and elevator design requirements for earthquake loads in ASCE 7.
 - 1. Effective peak velocity acceleration (A_v) for Project's location is less than 0.10 (seismic risk zones 0 and 1).
 - 2. Design earthquake spectral response acceleration, short period (S_d s) for Project is as noted on the structural drawings
 - 3. Project's seismic design category is as noted on the structural drawings.
 - 4. Elevator importance factor is 1.0.
- D. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
- E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging.
- B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.7 COORDINATION

- A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.
- B. Coordinate sequence of elevator installation with other work to avoid delaying the Work.
- C. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

1.8 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - a. Response Time: Two hours or less.
- B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in the same form as, "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. KONE Inc.
 - 2. Otis Elevator Co.
 - 3. Schindler Elevator Corp.
 - 4. ThyssenKrupp Elevator.

2.2 SYSTEMS AND COMPONENTS

- A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard preengineered elevator systems and as required for complete system.
- B. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations. Provide the following:
 - 1. Submersible pump, with submersible squirrel-cage induction motor, suspended inside oil tank from vibration isolation mounts.
 - 2. Provide motor with wye-delta starting.
 - 3. Provide variable-voltage variable-frequency motor control.
- C. Hydraulic Silencers: Provide hydraulic silencer containing pulsation-absorbing material in a blowout-proof housing at pump unit.
- D. Piping: Provide size, type, and weight piping recommended by manufacturer, and provide flexible connectors to minimize sound and vibration transmissions from power unit.
 - 1. Casing for Underground Piping: PVC pipe complying with ASTM D 1785, joined with PVC fittings complying with ASTM D 2466 and solvent cement complying with ASTM D 2564.
- E. Hydraulic Fluid: Nontoxic, readily biodegradable, fire-resistant fluid made from vegetable oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives. Hydraulic fluid is approved by elevator manufacturer for use with elevator equipment.
 - 1. Product: Subject to compliance with requirements, provide "Hydro Safe" by Hydro Safe Oil Division, Inc.
- F. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section.
- G. Car Frame and Platform: Welded steel units.
- H. Guides: Provide either roller guides or sliding guides at top and bottom of car and counterweight frames. If sliding guides are used, provide guide-rail lubricators or polymer-coated, nonlubricated guides.

2.3 OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation system for each group of elevators as required to provide type of operation system indicated.
- B. Single-Car Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:
 - 1. Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on

- standby power, either for return operation or for regular operation, by switches in control panel located at main lobby. Manual operation causes automatic operation to cease.
2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors will begin closing.
- C. Group Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators and elevator groups where indicated:
1. Standby Power Operation: On activation of standby power, cars are returned to a designated floor and parked with doors open. Only one car is moved upward at a time, with priority given to loaded cars. If a car cannot be returned after two attempts, it is removed from the system. When all cars have been returned or removed from the system, one car is automatically placed in service. If car selected for service cannot operate within 60 seconds, the system removes car from service and places another car in service. Cars can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at main lobby. Manual operation causes automatic operation to cease.
 2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors will begin closing.
 3. Independent Service: Keyswitch in car control station removes car from group operation and allows it to respond only to car calls. Key cannot be removed from keyswitch when car is in independent service. When in independent service, doors close only in response to door close button.
 4. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car will respond only to car calls, not to hall calls.

2.4 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

2.5 FINISH MATERIALS

- A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.
- D. Stainless-Steel Bars: ASTM A 276, Type 304.
- E. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- F. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (architectural bronze).
- G. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063.
- H. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500 or No. C77600.

2.6 CAR ENCLOSURES

- A. General: Provide steel-framed car enclosures with nonremovable wall panels, with car roof, access doors, power door operators, and ventilation.
1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
 2. Provide finished car including materials and finishes specified below.
- B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:
1. Subfloor: Underlayment grade, exterior plywood, 5/8-inch (16-mm) nominal thickness.
 2. Floor Finish: The floor finish shown in the elevator lobby shall be installed in each elevator cab in a thin set application. The overall thickness of the flooring material shall be limited to an overall thickness of 10 to 20 mm.
 3. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 4. Wood Veneer Wall Panels: Pecan wood veneers, that match the pecan wall panels utilized throughout this project, shall be adhesively applied to 1/2-inch (13-mm) fire-retardant-treated plywood. These wood panels shall be installed on the side and rear walls of all elevator cabs.
 5. Fabricate car with recesses and cutouts for signal equipment.
 6. Fabricate car door frame integrally with front wall of car.
 7. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 8. Sight Guards: Provide sight guards on car doors.
 9. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
 10. Metal Ceiling: Flush panels, with incandescent downlights in the center of] each panel. Align ceiling panel joints with joints between wall panels.
 11. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.7 HOISTWAY ENTRANCES

- A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.
1. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.
- B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:
1. Steel Subframes: Formed from cold-rolled or hot-rolled steel sheet with factory-applied enamel finish or corrosion-inhibiting primer. Fabricate to receive applied finish as indicated.
 2. Stainless-Steel Frames: Formed from stainless-steel sheet.
 3. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.

4. Sight Guards: Provide sight guards on doors matching door edges.
5. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
6. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.8 SIGNAL EQUIPMENT

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life incandescent lamps and acrylic or other permanent, nonyellowing translucent plastic diffusers or LEDs.
- B. Car Control Stations: Provide manufacturer's standard recessed car control stations. Mount in return panel adjacent to car door, unless otherwise indicated.
 1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille.
 2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- D. Firefighters' Two-Way Telephone Communication Service: If required by local codes and ordinances, provide telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 13 Section "Fire Alarm."
- E. Hall Push-Button Stations: Provide one hall push-button station at each landing for each single elevator or group of elevators.
 1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
 3. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Division 13 Section "Fire Alarm."
- F. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:
 1. Manufacturer's standard wall-mounted units, for mounting in location shown on drawings.
- G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
 1. At manufacturer's option, audible signals may be placed on each car.

- H. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.

- I. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.

2.9 ELEVATORS

A. Elevator at Garage - Service:

- 1. Elevator Number(s): 01
- 2. Type: Holeless, beside-the-car, telescoping, dual cylinder.
- 3. Rated Load: 3500 lb.
- 4. Rated Speed: 100 fpm (0.51 m/s).
- 5. Operation System: Single automatic operation.
- 6. Auxiliary Operations:
 - a. Standby power operation.
 - b. Automatic dispatching of loaded car.

- 7. Car Enclosures:
 - a. Inside Width: 80 inches (2032 mm) from side wall to side wall.
 - b. Inside Depth: 51 inches (1295 mm) from back wall to front wall (return panels).
 - c. Inside Height: 94 inches (2388 mm) to underside of ceiling.
 - d. Front Walls (Return Panels): Satin bronze, lacquered with integral car door frames.
 - e. Car Fixtures: Satin bronze, lacquered.
 - f. Side and Rear Wall Panels: Wood veneer wall panels as previously noted in this specification.
 - g. Reveals: Satin bronze, lacquered.
 - h. Door Faces (Interior): Satin bronze, lacquered.
 - i. Door Sills: Bronze.
 - j. Ceiling: Satin bronze, lacquered.
 - k. Handrails: 1/2 by 2 inches (13 by 50 mm) rectangular satin stainless steel, No. 4 finish, at sides and rear of car.
 - l. Floor recessed and prepared to receive the floor finish to match the lobby finish immediately adjacent to the elevator cab.
 - m. Floor Thickness, Including Setting Materials: 1/2" above plywood subfloor.

- 8. Hoistway Entrances:
 - a. Width: 42 inches (1067 mm).
 - b. Height: 84 inches (2134 mm).
 - c. Type: Single-speed side sliding.
 - d. Fire-Protection Rating: 1 hour with 30-minute temperature rise of 450 deg F (250 deg C).
 - e. Frames: Satin bronze, lacquered.. To be determined by architect.

- f. Doors : Satin bronze, lacquered.. To be determined by architect.
 - g. Sills: Bronze.
9. Hall Fixtures: Satin bronze, lacquered finish . To be determined by architect.

B. Elevators:

- 1. Elevator Number(s): 02, 03 and 04
- 2. Type: Holeless, beside-the-car, telescoping, dual cylinder.
- 3. Rated Load: 3000 lb.
- 4. Rated Speed: 100 fpm (0.51 m/s).
- 5. Operation System: Group automatic operation.
- 6. Auxiliary Operations:
 - a. Standby power operation.
 - b. Automatic dispatching of loaded car.
- 7. Car Enclosures:
 - a. Inside Width: 80 inches (2032 mm) from side wall to side wall.
 - b. Inside Depth: 51 inches (1295 mm) from back wall to front wall (return panels).
 - c. Inside Height: 94 inches (2388 mm) to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
 - e. Car Fixtures: Satin stainless steel, No. 4 finish.
 - f. Side and Rear Wall Panels: Wood veneer wall panels as previously noted in this specification.
 - g. Reveals: Satin stainless steel, No. 4 finish.
 - h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
 - i. Door Sills: Nickel silver, polished.
 - j. Ceiling: Satin stainless steel, No. 4 finish.
 - k. Handrails: 1/2 by 2 inches (13 by 50 mm) rectangular satin stainless steel, No. 4 finish, at sides and rear of car.
 - l. Floor recessed and prepared to receive the floor finish to match the lobby finish immediately adjacent to the elevator cab.
 - m. Floor Thickness, Including Setting Materials: 1 1/4" above plywood subfloor.
- 8. Hoistway Entrances:
 - a. Width: 42 inches (1067 mm).
 - b. Height: 84 inches (2134 mm).
 - c. Type: Single-speed side sliding.
 - d. Fire-Protection Rating: 1 hour with 30-minute temperature rise of 450 deg F (250 deg C).
 - e. Frames: satin stainless steel, No. 4 finish . Doors : satin stainless steel, No. 4 finish .
 - f. Sills: Nickel silver, polished.
- 9. Hall Fixtures: satin stainless steel, No. 4 finish ..

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
 - 1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby eliminate sources of structure-borne noise from elevator system.
- D. Install piping above the floor, where possible. Where not possible, install underground piping in Schedule 40 PVC pipe casing assembled with solvent-cemented fittings.
- E. Lubricate operating parts of systems as recommended by manufacturers.
- F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- G. Leveling Tolerance: 1/4 inch (6 mm), up or down, regardless of load and direction of travel.
- H. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- I. Locate hall signal equipment for elevators as follows, unless otherwise indicated:
 - 1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
 - 2. Place hall lanterns beside each hoistway entrance.
 - 3. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: Limit temporary use for construction purposes to one elevator. Comply with the following requirements for each elevator used for construction purposes:
 - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 - 2. Provide strippable protective film on entrance and car doors and frames.
 - 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 - 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 - 5. Do not load elevators beyond their rated weight capacity.
 - 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s). Refer to Division 1 Section "Demonstration and Training."
- B. Check operation of each elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.
- C. Check operation of each elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION 14240

SECTION 14560 - CHUTES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Waste chutes.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for metal supporting framework at floor penetrations.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for roof vent flashing and counterflashing.
 - 3. Division 7 Section "Through-Penetration Firestop Systems" for annular spaces at doors, floors, or roofs.
 - 4. Division 13 Section "Fire-Suppression Piping" for fire sprinklers.
 - 5. Division 16 Sections for electrical-service connections.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail chute assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal and control wiring.
- C. Product Certificates: For each type of chute, signed by product manufacturer.
- D. Operation and Maintenance Data: For chutes to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Provide chutes complying with NFPA 82.

- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated.
 - 1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
 - 2. Intake Door: Class B labeled; **1-1/2**-hour fire rated.
 - 3. Discharge Door: Class B labeled; 1-hour fire rated.

- C. 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS"

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Midland Metalcraft Co.
 - 2. U.S. Chutes.
 - 3. Valiant Products, Inc.
 - 4. Wilkinson Hi-Rise, LLC.

2.2 CHUTES

- A. Chute Metal: Aluminum-coated, cold-rolled, commercial steel sheet; ASTM A 463/A 463M, Type 1 with not less than **T1-40 (T1M-120)** coating.
 - 1. Thickness: **0.060 inch (1.6 mm)**.

- B. Size: **24-inch (610-mm) diameter**.

2.3 DOORS

- A. Intake Door Assemblies: ASTM A 240/A 240M, Type 304 stainless-steel, self-closing units with positive latch and latch handle; as required to provide fire-protection ratings indicated; and with frame suitable for enclosing chase construction.
 - 1. Door Type: **Hopper**.
 - 2. Size: Manufacturer's standard size for door type, chute type, and diameter indicated.
 - 3. Finish: Manufacturer's standard satin or No. 3 directional polish.
 - 4. Mechanical Interlocks: Interlock system operated from discharge door to automatically lock intake doors.
 - 5. Electrical Interlocks: Interlock system that is energized by opening one intake door; remaining doors automatically lock when system is energized.

- B. Discharge-Door Assemblies: Aluminum-coated-steel doors as required to provide fire-protection ratings indicated; equipped with fusible links that cause doors to close in the event of fire.
 - 1. Direct Vertical Discharge: Provide inclined, horizontally rolling, shutter-type unit.
- C. Heat-**and Smoke**-Detector System: Interlock system with temperature-rise elements that locks chute doors when temperature in chute reaches a predetermined, adjustable temperature
 - 1. Locate smoke detector outside discharge door with solenoid to close discharge door.
- D. Access Door Assemblies: Manufacturer's standard ASTM A 240/A 240M, Type 302/304 stainless-steel doors; as required to provide fire-protection ratings indicated; with frame suitable for enclosing chase construction; and in satin or No. 3 directional polish finish.

2.4 ACCESSORIES

- A. Fire Sprinklers: NPS 1/2 (DN 13) fire sprinklers ready for piping connections.
- B. Flushing Spray Unit: NPS 3/4 (DN 19) spray head unit located in chute above highest intake door, ready for hot-water piping connection, and with access for head and piping maintenance.
- C. Intake Door Baffles: Rubber baffles, 1/8 inch (3 mm) thick.
- D. Sound Dampening: Manufacturer's standard exterior mastic coating on chute.
 - 1. Sound and vibration isolator pads at floor supporting frames.
- F. ADA complaint automatic door operator.

2.5 FABRICATION

- A. General: Factory-assemble chutes to greatest extent practical with continuously welded or lock-seamed joints without bolts, rivets, or clips projecting on chute interior. Include intake-door assemblies and metal supporting framing at each floor, and chute expansion joints between each support point.
- B. Roof Vent: Fabricate vent unit to extend **36 inches (910 mm)** above roof with full-diameter, screened vent and metal safety cap or glass explosion-release cap. Fabricate with roof-deck flange, counterflashing, and clamping ring of nonferrous metal compatible with chute metal.
- C. Fire Sprinklers: Comply with NFPA 13. Locate fire sprinklers at or above the top service opening of chutes, within the chute at alternate floor levels in buildings more than two stories tall, and at the lowest service level.

- D. Equipment Access: Fabricate chutes with access for maintaining equipment located within the chute, such as flushing and sanitizing units, fire sprinklers, and plumbing and electrical connections.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with NFPA 82 requirements and with chute manufacturer's written instructions. Assemble components with tight, nonleaking joints. Anchor securely to supporting structure to withstand impact and stresses on vent units. Install chute and components to maintain fire-resistive construction of chute and enclosing chase.
- B. Install chutes plumb, without offsets or obstructions that might prevent materials from free falling within chutes.
- C. Anchor roof flanges of chute vents before installing roofing and flashing. Install chute-vent counterflashing after roofing and roof-penetration flashing are installed.
- D. Intake and Discharge Doors: Interface door units with throat sections of chutes for safe, snag-resistant, sanitary depositing of materials in chutes by users.
- E. Electrical Interlock System: Comply with applicable NECA 1 recommendations.
- F. Test chute components after installation. Operate doors, locks, and interlock systems to demonstrate that hardware is adjusted and electrical wiring is connected correctly. Complete test operations before installing chase enclosures.
- G. Test fire sprinklers and heat- and smoke-sensing devices for proper operation.

3.2 CLEANING

- A. After completing chase enclosure, clean exposed surfaces of chute system's components. Do not remove labels of independent testing and inspecting agencies.

3.3 DEMONSTRATION

- A. Demonstrate use of chute and equipment to Owner's personnel.
- B. Demonstrate replenishment of sanitizing-unit chemicals or cleaning fluids.

END OF SECTION 14560

CADET® 3 ELONGATED TOILET

270CA.001

- Features the **Cadet® Flushing System**
- Vitreous china
- Low consumption (6.0 Lpf/1.6 gpf) toilet
- PowerWash® rim scrubs bowl with each flush
- Includes color match bowl caps
- EverClean® surface included
- 3" flush valve
- 2-1/8" trapway
- 12" (305mm) rough-in
- Generous 9" x 8" water surface area
- Chrome finish trip lever is supplied
- 1,000g MaP Score** at 1.6 gpf
- 5 year warranty

- 3717C.001 Elongated Bowl**
- 4021.001N Tank**

Nominal Dimensions:

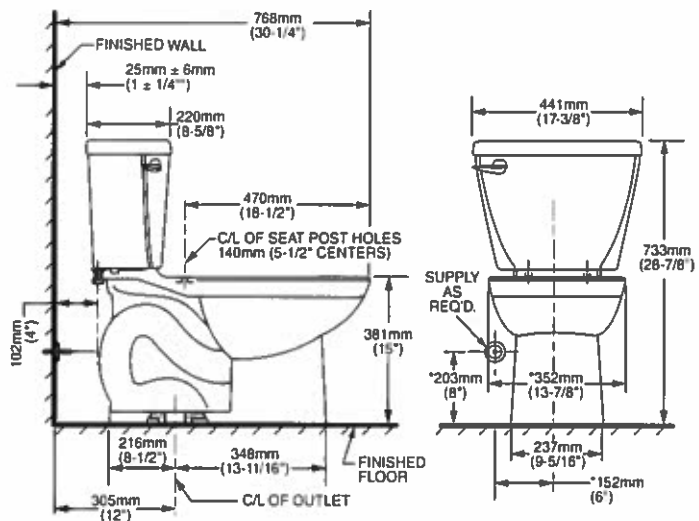
768 x 441 x 733mm (30-1/4" x 17-3/8" x 28-7/8")

Fixture only, seat and supply sold separately

Compliance Certifications -

Meets or Exceeds the Following Specifications:

- ASME A112.19.2-2008/CSA B45.1-08 for Vitreous China Fixtures



NOTES:

THIS TOILET IS DESIGNED TO ROUGH-IN AT A MINIMUM DIMENSION OF 305MM (12") FROM FINISHED WALL TO C/L OF OUTLET. SUPPLY NOT INCLUDED WITH FIXTURE AND MUST BE ORDERED SEPARATELY. * DIMENSION SHOWN FOR LOCATION OF SUPPLY IS SUGGESTED.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

** Maximum Performance (MaP) testing performed by IAPMO R&T Lab. MaP Report conducted by Veritec Consulting, Inc. and Koeller and Company.

To Be Specified:

- Color: White Bone Linen Black
- Seat: #5321.110 EverClean® Elongated Seat with Slow Close Snap-Off Hinges
- Supply with stop:

CADET® 3
Flushing System

WIC-2

American Standard

Style That Works Better

BARRIER FREE

CADET® 3 RIGHT HEIGHT™ 14" ROUGH-IN ELONGATED TOILET
VITREOUS CHINA

CADET® 3 RIGHT HEIGHT™ 14" ROUGH-IN ELONGATED TOILET

- 2386.014
 - Vitreous china
 - Low-consumption (6.0 Lpf/1.6 gpf)
 - EverClean® surface inhibits the growth of stain- and odor-causing bacteria, mold, and mildew on the surface
 - Features the **Cadet® 3 Flushing System**
 - 16-1/2" rim height for accessible application
 - Elongated siphon action jetted bowl
 - Fully-glazed 2-1/8" trapway with 2" ball pass
 - Generous 9" x 8" water surface area
 - Close-coupled tank with flat tank cover for superior storage
 - Oversized 3" flush valve with chemical resistant flapper
 - Chrome trip lever
 - Speed Connect® tank-to-bowl coupling system
 - Sanitary dam on bowl with four point tank stabilization
 - 2 color-matched bolt caps
 - 100% factory flush tested
 - 5 year warranty

- 3016.016 Right Height™ Elongated Bowl
- 3016.001 Right Height™ Elongated Universal Bowl
- 4027.016 Tank

Nominal Dimensions:
819 x 445 x 775mm (32-1/4" x 17-1/2" x 30-1/2")

Fixture only, seat and supply by others

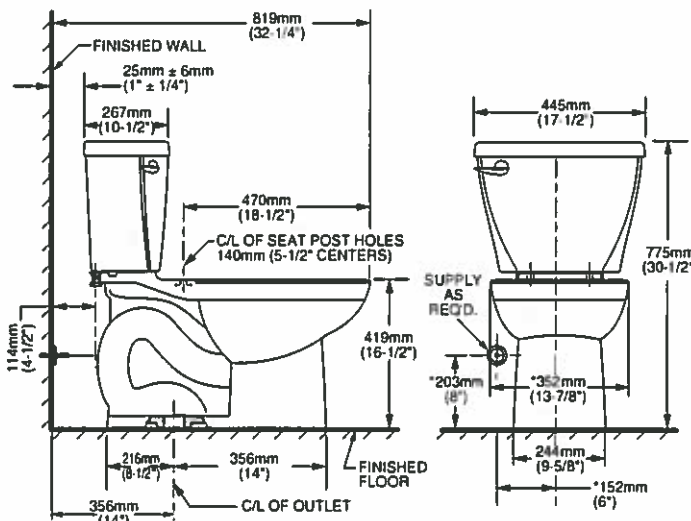
Alternative Tank Configurations Available:

- 4027.600 Tank complete with tank cover locking device
- 4027.800 Tank complete with trip lever on right side
- 4027.900 Tank complete with tank cover locking device and trip lever on right side

Compliance Certifications - Meets or Exceeds the Following Specifications:
• ASME A112.19.2-2008/CSA B45.1-08 for Vitreous China Fixtures

To Be Specified:

- Color: White Bone Linen Black
- Seat: #5325.010 Elongated Champion® Slow Close solid plastic seat and cover with easy lift off feature
- Seat: #5284.016 Elongated EverClean® solid plastic seat and cover
- Seat: #5321.110 EverClean® Elongated Seat with Slow Close Snap-Off Hinges
- Supply with stop:



NOTES:
THIS TOILET IS DESIGNED TO ROUGH-IN AT A MINIMUM DIMENSION OF 356MM (14") FROM FINISHED WALL TO C/L OF OUTLET. SUPPLY NOT INCLUDED WITH FIXTURE AND MUST BE ORDERED SEPARATELY.
* DIMENSION SHOWN FOR LOCATION OF SUPPLY IS SUGGESTED.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 REQUIREMENTS FOR ACCESSIBLE AND USABLE BUILDING FACILITIES-CHECK LOCAL CODES.

CADET® 3
Flushing System

American Standard

Style That Works Better

**MADERA™ 15" HEIGHT 1.6 GPF
FLUSHOMETER TOILET SYSTEM****LESS EVERCLEAN®
MANUAL FLUSH VALVE****MADERA™ 15" HEIGHT 1.6 GPF
FLUSHOMETER TOILET SYSTEM LESS EVERCLEAN®**

- 2858.016** 1.6 gpf 15" Height Top Spud Bowl and Manual Flush Valve

BOWL:

- Floor mount elongated flushometer valve toilet
- Vitreous china
- High Efficiency, Low Consumption. Operates in the range of 1.1 gpf to 1.6 gpf (4.2 Lpf to 6.0 Lpf)
- Meets definition of HET (High Efficiency Toilet) when used with a high efficiency flush valve (1.28 gpf or 1.6 / 1.1 gpf Dual Flush)
- Conventional glaze
- Fully glazed 2-1/8" trapway
- 10" or 12" roughing-in
- 15" rim height
- Condensation channel
- Powerful direct-fed siphon jet action
- 10" x 12" water surface area
- 1-1/2" inlet spud
- 100% factory flush tested
- Less toilet seat
- Model 2234.001

MANUAL FLUSH VALVE:

- Self-cleaning brass piston with integral wiper spring prevents clogging and reduces maintenance
- Piston operation delivers superior flush accuracy and repeatability
- Piston valve remains closed and does not need to be reset after loss of water pressure
- Non-hold open handle
- Positive seal ensures leak-free performance
- No external volume adjustment
- Durable chrome-plated cast brass construction is ideal for commercial applications
- Chloramine-resistant EPDM seals
- Adjustable tailpiece for rough-in flexibility
- Can be installed left or right hand
- Model 6047.161 for 11-1/2" supply C/L to top of bowl, 1.6 gpf with 1-1/2" top spud

Includes:

- 047007-0070A Inlet Spud (furnished with bowl)
- 481310-100 2 Bolt caps with retainers (furnished with bowl)
- 1" I.P.S. angle stop with back-flow prevention and vandal-resistant cap
- Sweat solder kit including cover tube and wall flange
- High back pressure vacuum breaker with down tube
- Spud coupling & flange for 1-1/2" top spud

To Be Specified:

- Color: White
- Seat:
- American Standard #5901.100 Heavy duty open front less cover
 - American Standard #5905.100 Extra heavy duty open front less cover



SEE REVERSE FOR ROUGHING-IN DIMENSIONS

System MaP* Score:

- 1,000 grams of miso @ 1.6 gpf

* Maximum Performance (MaP) testing performed by IAPMO R&T Lab. MaP Report conducted by Veritec Consulting, Inc. and Koeller and Company.

Operating Pressure:

Overall Range: 20-125 psi**

Recommended: 25 psi (flowing)-80 psi (static)

** Water pressure over 80 psi is not recommended for most plumbing fixtures.

Flow Requirement:

25gpm (94.6 L/min.)

Nominal Fixture Dimensions:

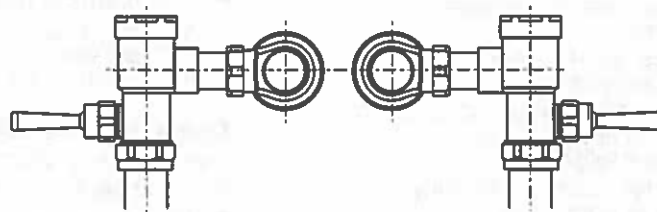
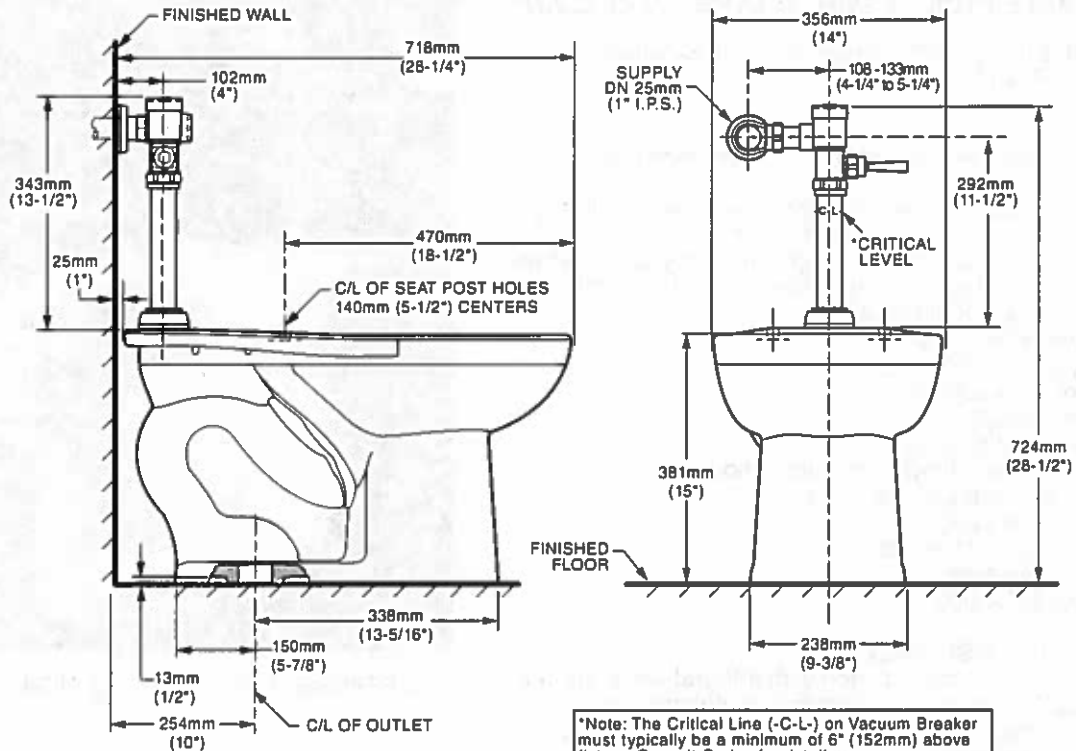
718 x 356 x 381mm (28-1/4" x 14" x 15")

Fixture Compliance Certifications -**Meets or Exceeds the Following Specifications:**

- ASME A112.19.2-2008 / CSA B45.1-08 for Vitreous China Fixtures

Valve Listings:

- ASSE 1037
- ANSI/ASME A112.19.2
- ADA Compliant



Valve Left or Right Hand Installation

NOTES:
TO COMPLY WITH AREA CODE GOVERNING THE HEIGHT OF VACUUM BREAKER ON THE FLUSHOMETER VALVE, THE PLUMBER MUST VERIFY DIMENSIONS SHOWN FOR SUPPLY ROUGHING. THIS TOILET DESIGNED TO ROUGH-IN AT A MINIMUM DIMENSION OF 254MM (10") AND A MAXIMUM DIMENSION OF 305MM (12") FROM FINISHED WALL TO C/L OF OUTLET.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

WC-4

American Standard

Style That Works Better

 BARRIER FREE

MADERA™ 16-1/2" HEIGHT 1.6 GPF FLUSHOMETER TOILET SYSTEM

LESS EVERCLEAN®
MANUAL FLUSH VALVE

MADERA™ 16-1/2" HEIGHT 1.6 GPF FLUSHOMETER TOILET SYSTEM LESS EVERCLEAN®

- 2857.016 1.6 gpf Top Spud 16-1/2" Height Bowl and Manual Flush Valve

BOWL:

- Floor mount elongated flushometer valve toilet
- Vitreous china
- High Efficiency, Low Consumption. Operates in the range of 1.1 gpf to 1.6 gpf (4.2 Lpf to 6.0 Lpf)
- Meets definition of HET (High Efficiency Toilet) when used with a high efficiency flush valve (1.28 gpf or 1.6 / 1.1 gpf Dual Flush)
- Conventional glaze
- 10" or 12" roughing-in
- 16-1/2" rim height for accessible application
- Condensation channel
- Powerful direct-fed siphon jet action
- Fully glazed 2-1/8" trapway
- 10" x 12" water surface area
- 1-1/2" inlet spud
- 100% factory flush tested
- Less toilet seat
- Model 3043.001

MANUAL FLUSH VALVE:

- Self-cleaning brass piston with integral wiper spring prevents clogging and reduces maintenance
- Piston operation delivers superior flush accuracy and repeatability
- Piston valve remains closed and does not need to be reset after loss of water pressure
- Non-hold open handle
- Positive seal ensures leak-free performance
- No external volume adjustment
- Durable chrome-plated cast brass construction is ideal for commercial applications
- Chloramine-resistant EPDM seals
- Adjustable tailpiece for rough-in flexibility
- Can be installed left or right hand
- Model 6047.161 for 11-1/2" supply C/L to top of bowl, 1.6 gpf with 1-1/2" top spud

Includes:

- 047007-0070A Inlet Spud (furnished with bowl)
- 481310-100 2 Bolt caps with retainers (furnished with bowl)
- 1" I.P.S. angle stop with back-flow prevention and vandal-resistant cap
- Sweat solder kit including cover tube and wall flange
- High back pressure vacuum breaker with down tube
- Spud coupling & flange for 1-1/2" top spud

To Be Specified:

- Color: White
- Seat:
 - American Standard #5901.100 Heavy duty open front less cover
 - American Standard #5905.100 Extra heavy duty open front less cover



SEE REVERSE FOR ROUGHING-IN DIMENSIONS

System MaP* Score:

- 1,000 grams of miso @ 1.6 gpf

* Maximum Performance (MaP) testing performed by IAPMO R&T Lab. MaP Report conducted by Veritec Consulting, Inc. and Koeller and Company.

Operating Pressure:

Overall Range: 20-125 psi**

Recommended: 25 psi (flowing)-80 psi (static)

** Water pressure over 80 psi is not recommended for most plumbing fixtures.

Flow Requirement:

25gpm (94.6 L/min.)

Nominal Fixture Dimensions:

718 x 356 x 419mm (28-1/4" x 14" x 16-1/2")

Fixture Compliance Certifications -

Meets or Exceeds the Following Specifications:

- ASME A112.19.2-2008 / CSA B45.1-08 for Vitreous China Fixtures

Valve Listings:

- ASSE 1037
- ANSI/ASME A112.19.2
- ADA Compliant

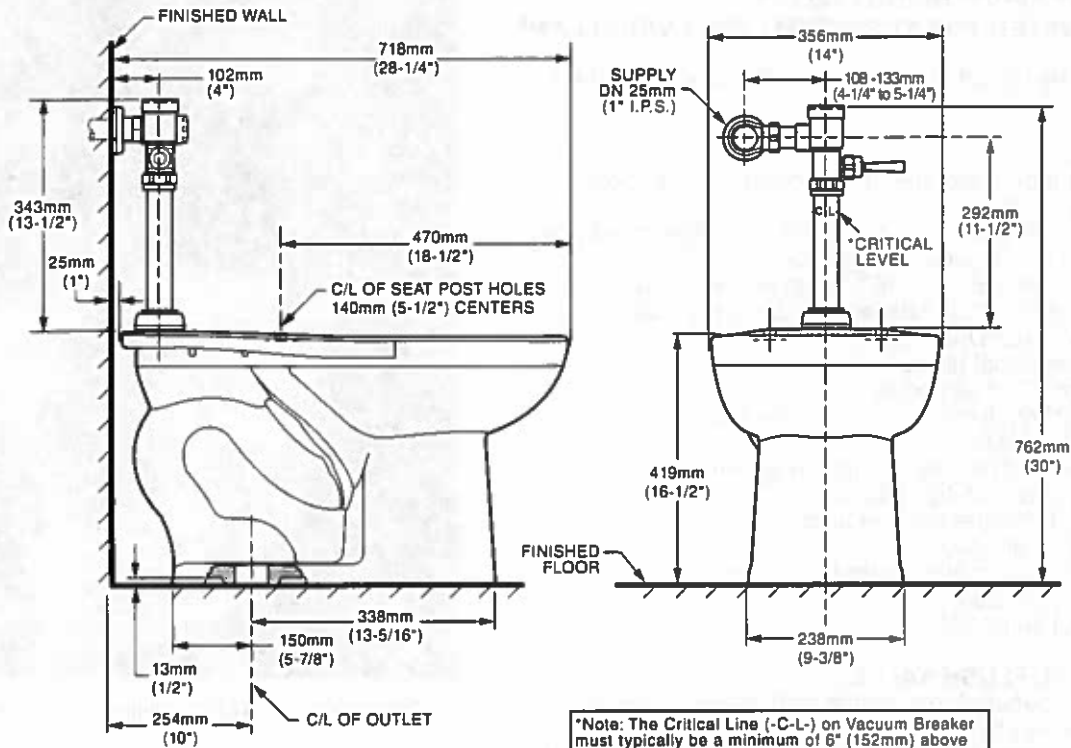
American Standard

Style That Works Better

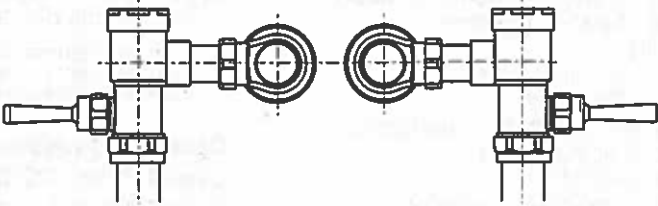
BARRIER FREE

**MADERA™ 16-1/2" HEIGHT 1.6 GPF
FLUSHOMETER TOILET SYSTEM**

**LESS EVERCLEAN®
MANUAL FLUSH VALVE**



*Note: The Critical Line (-C-L-) on Vacuum Breaker must typically be a minimum of 6" (152mm) above fixture. Consult Codes for details.



Valve Left or Right Hand Installation

MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 REQUIREMENTS FOR ACCESSIBLE AND USABLE BUILDING FACILITIES - CHECK LOCAL CODES.

NOTES:
TO COMPLY WITH AREA CODE GOVERNING THE HEIGHT OF VACUUM BREAKER ON THE FLUSHOMETER VALVE, THE PLUMBER MUST VERIFY DIMENSIONS SHOWN FOR SUPPLY ROUGHING. THIS TOILET DESIGNED TO ROUGH-IN AT A MINIMUM DIMENSION OF 254MM (10") AND A MAXIMUM DIMENSION OF 305MM (12") FROM FINISHED WALL TO C/L OF OUTLET.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

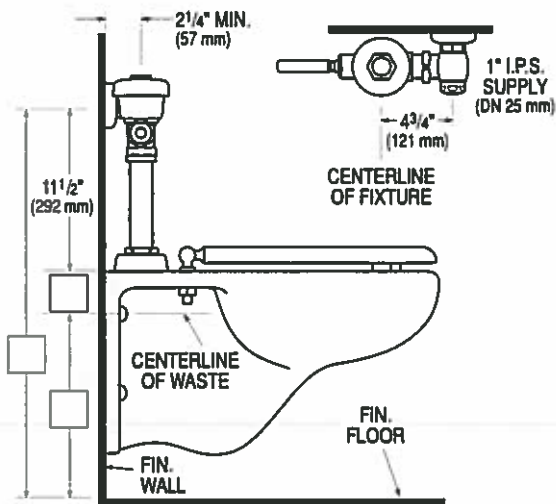
WC-3 & WC-4



Sloan® Model Flushometer

110/111

- ▶ **Description**
Exposed Water Closet Flushometer for floor mounted or wall hung top spud bowls.
 - ▶ **Flush Cycle**
 - Model 110 Water Saver (3.5 gpf/13.2 Lpf)
 - Model 111 Low Consumption (1.6 gpf/6.0 Lpf)
 - ▶ **Variations**
 - TP Trap Primer
 - DFB Dual Filtered Fixed Bypass Diaphragm
 - YO Bumper on Angle Stop
 - ▶ **Specifications**
Quiet, Exposed, Diaphragm Type, Chrome Plated Closet Flushometer with the following features:
 - High Chloramine Resistant PERMEX™ Synthetic Rubber Diaphragm with Linear Filtered Bypass and Vortex Cleansing Action™
 - ADA Compliant Metal Oscillating Non-Hold-Open Handle with Triple Seal Handle Packing
 - 1" I.P.S. Screwdriver Bak-Chek™ Angle Stop
 - Vandal Resistant Stop Cap
 - Adjustable Tailpiece
 - Vacuum Breaker with Flush Connection
 - Spud Coupling and Spud Flange for 1½" Top Spud
 - Sweat Solder Adapter with Cover Tube and Cast Wall Flange
 - High Copper, Low Zinc Brass Castings for Dezincification Resistance
 - Non-Hold-Open Handle and No External Volume Adjustment to Ensure Water Conservation
 - Low Consumption flush accuracy
 - Handle Packing, Stop Seat and Vacuum Breaker Molded from PERMEX™ Rubber Compound for Chloramine Resistance
- Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037.
- ▶ **Accessories**
See Accessories Section of the Sloan catalog for details on these and other Flushometer variations.



Made In The
USA

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SLOAN.

SLOAN VALVE COMPANY • 10500 SEYMOUR AVE. • FRANKLIN PARK, IL 60131
Ph: 1-800-9-VALVE-9 or 1-847-671-4300 • Fax: 1-800-447-8329 or 1-847-671-4380
www.sloanvalve.com

American Standard

Style That Works Better

 BARRIER FREE

WASHBROOK® 1.0 GPF WASHOUT URINAL SYSTEM

- ❑ 6501.511 1.0 gpf Exposed Top Spud Urinal and Manual Piston-Type Urinal Flush Valve

URINAL:

- Vitreous china
- Ultra High Efficiency, Low Consumption. Operates in the range of 0.125 gpf to 1.0 gpf (0.5 Lpf to 3.8 Lpf)
- Flushing rim
- Elongated 14" rim from finished wall
- Washout flush action
- Extended sides for privacy
- 3/4" inlet spud
- Outlet connection threaded 2" inside (NPTF)
- Strainer included
- Meets ANSI flush requirements at 1.0 gpf
- Model 6590.001 top spud

MANUAL FLUSH VALVE:

- Self-cleaning brass piston with integral wiper spring prevents clogging and reduces maintenance
- Piston operation delivers superior flush accuracy and repeatability
- Piston valve remains closed and does not need to be reset after loss of water pressure
- Non-hold open handle
- Positive seal ensures leak-free performance
- No external volume adjustment
- Durable chrome-plated cast brass construction is ideal for commercial applications
- Chloramine-resistant EPDM seals
- Adjustable tailpiece for rough-in flexibility
- Can be installed left or right hand
- Model 6045.101 for 3/4" top spud urinals, 1.0 gpf

Includes:

- 2 Wall hangers
- 3/4" I.P.S. angle stop with back-flow protection and vandal-resistant cap
- Sweat solder kit including cover tube and wall flange
- High back pressure vacuum breaker with down tube
- Spud coupling and flange for 3/4" top spud

To Be Specified:

- ❑ Color: White



MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES - CHECK LOCAL CODES.

- When installed so top of rim is 387mm (15-1/4") from finished floor.

U-1

WASHBROOK® 1.0 GPF URINAL SYSTEM MANUAL FLUSH VALVE



SEE REVERSE FOR ROUGHING-IN DIMENSIONS

Operating Pressure:

Overall Range: 20-125 psi**

Recommended: 20 psi (flowing)-80 psi (static)

** Water pressure over 80 psi is not recommended for most plumbing fixtures.

Flow Requirement:

10gpm (37.9 L/min.)

Nominal Fixture Dimensions:

360 x 480 x 664mm (14-1/8" x 18-7/8" x 26-1/8")

Fixture Compliance Certifications -

Meets or Exceeds the Following Specifications:

- ASME A112.19.2-2008/CSA B45.1-08 for Vitreous China Fixtures

Valve Listings:

- ASSE 1037
- ANSI/ASME A112.19.2
- ADA Compliant

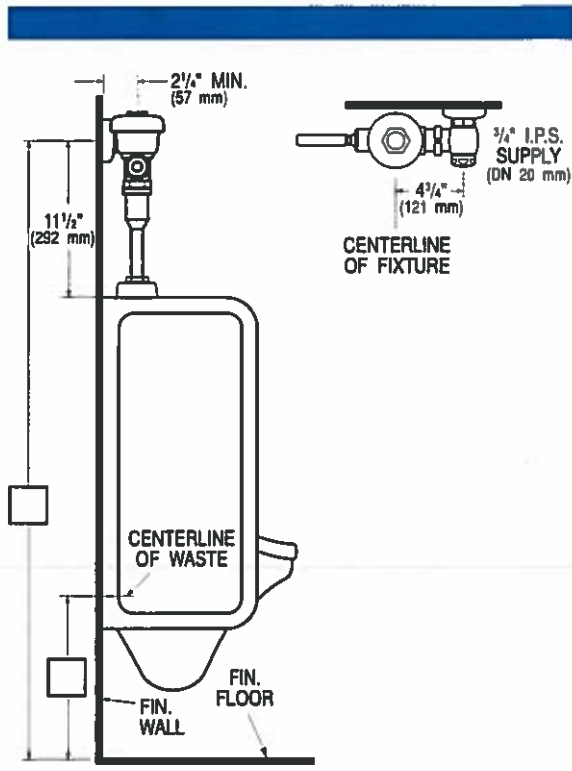
U-1



Sloan® Model 186 Flushometer

186

- ▶ **Description**
Exposed Urinal Flushometer for 3/4" top spud urinals.
 - ▶ **Flush Cycle**
 - Model 186 Water Saver (1.5 gpf/5.7 Lpf)
 - Model 186-1.0 Low Consumption (1.0 gpf/3.8 Lpf)
 - ▶ **Variations**
 - DFB Dual Filtered Fixed Bypass Diaphragm
 - ▶ **Specifications**
Quiet, Exposed, Diaphragm Type, Chrome Plated Urinal Flushometer with the following features:
 - High Chloramine Resistant PERMEX™ Synthetic Rubber Diaphragm with Linear Filtered Bypass and Vortex Cleansing Action™
 - ADA Compliant Metal Oscillating Non-Hold-Open Handle with Triple Seal Handle Packing
 - 3/4" I.P.S. Screwdriver Bak-Chek™ Angle Stop
 - Vandal Resistant Stop Cap
 - Adjustable Tailpiece
 - Vacuum Breaker with Flush Connection
 - Spud Coupling and Spud Flange for 3/4" Top Spud
 - Sweat Solder Adapter with Cover Tube and Cast Wall Flange
 - High Copper, Low Zinc Brass Castings for Dezincification Resistance
 - Non-Hold-Open Handle and No External Volume Adjustment to Ensure Water Conservation
 - Low Consumption flush accuracy
 - Handle Packing, Stop Seat and Vacuum Breaker Molded from PERMEX™ Rubber Compound for Chloramine Resistance
- Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037.
- ▶ **Accessories**
See Accessories Section of the Sloan catalog for details on these and other Flushometer variations.



Sloan 186 S.S. — Rev. 0d (06/10)
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www.sloanvalve.com

L-1 & L-2

Features

- Vitreous china
- Under-mount
- With or without overflow
- Available with KOHLER Artist Editions designs
- Includes 1193643 clamp assembly, unless specified
- 15" (381 mm) x 12" (305 mm)
- 17" (432 mm) x 14" (356 mm)
- 19" (483 mm) x 15" (381 mm)

UNDER-MOUNT BATHROOM SINK

K-2210

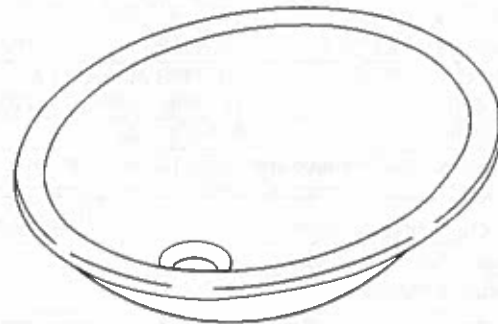
ALSO K-2211, K-2209

ADA CSA B651 OBC

Codes/Standards Applicable

Specified model meets or exceeds the following:

- ADA
- ICC/ANSI A117.1
- CSA B651
- OBC
- ASME A112.19.2/CSA B45.1



Colors/Finishes

- 0: White
- Other: Refer to Price Book for additional colors/finishes

Accessories

- CP: Polished Chrome
- Other: Refer to Price Book for additional colors/finishes

Specified Model

Model	Description	Colors/Finishes	
K-2209	Bathroom sink, 15" (381 mm) x 12" (305 mm), w/overflow, w/clamps	<input type="checkbox"/> 0	<input type="checkbox"/> Other _____
K-2210	Bathroom sink, 17" (432 mm) x 14" (356 mm), w/overflow, w/clamps	<input type="checkbox"/> 0	<input type="checkbox"/> Other _____
K-2210-G	Bathroom sink, 17" (432 mm) x 14" (356 mm), w/glazed underside, w/o overflow, w/clamps	<input type="checkbox"/> 0	<input type="checkbox"/> Other _____
K-2210-L	Bathroom sink, 17" (432 mm) x 14" (356 mm), w/overflow, w/o clamps	<input type="checkbox"/> 0	<input type="checkbox"/> Other _____
K-2210-N	Bathroom sink, 17" (432 mm) x 14" (356 mm), w/o overflow, w/clamps	<input type="checkbox"/> 0	<input type="checkbox"/> Other _____
K-2211	Bathroom sink, 19" (483 mm) x 15" (381 mm), w/overflow, w/clamps	<input type="checkbox"/> 0	<input type="checkbox"/> Other _____
K-2211-G	Bathroom sink, 19" (483 mm) x 15" (381 mm), w/glazed underside, w/o overflow, w/clamps	<input type="checkbox"/> 0	<input type="checkbox"/> Other _____
K-2211-L	Bathroom sink, 19" (483 mm) x 15" (381 mm), w/overflow, w/o clamps	<input type="checkbox"/> 0	<input type="checkbox"/> Other _____

Product Specification:

The under-mount bathroom sink shall be made of vitreous china. Bathroom sink shall be available with or without overflow. Bathroom sink shall be 15" (381 mm) in length and 12" (305 mm) in width, 17" (432 mm) in length and 14" (356 mm) in width, or 19" (483 mm) in length and 15" (381 mm) in width. Bathroom sink shall include 1193643 clamp assembly for all models except K-2210-L and K-2211-L. Bathroom sink shall be available with KOHLER Artist Editions designs. Bathroom sink shall be Kohler Model K-_____-____- or K-_____-____-_____.

CAXTON®

Technical Information

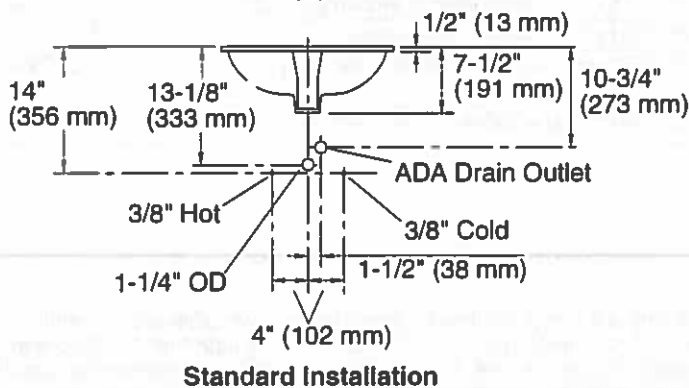
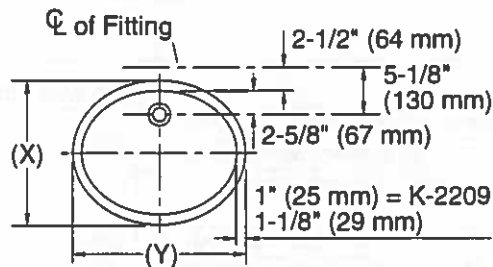
Recommended Accessories			
K-8998	P-Trap	<input type="checkbox"/> CP	<input type="checkbox"/> Other_____

Fixture*:	Basin area	Water depth
K-2209	15" (381 mm) x 12" (305 mm)	4" (102 mm)
K-2210/K-2210-L/ K-2210-N/K-2210-G	17" (432 mm) x 14" (356 mm)	4" (102 mm)
K-2211/K-2211-G/ K-2211-L	19" (483 mm) x 15" (381 mm)	4" (102 mm)
Drain hole	Ø 1-3/4" (44 mm)	
* Approximate measurements for comparison only.		

Cutout template, K-2209	85838-7
Cutout template, K-2210	1151011-7
Cutout template, K-2211	1018997-7

Included components:	
Basin clamp assembly (not included with K-2210-L and K-2211-L)	1193643

K-2209: (X) = 14" (356 mm), (Y) = 17" (432 mm)
 K-2210: (X) = 16-1/4" (413 mm), (Y) = 19-1/4" (489 mm)
 K-2211: (X) = 17-1/4" (438 mm), (Y) = 21-1/4" (540 mm)



Standard Installation

Installation Notes

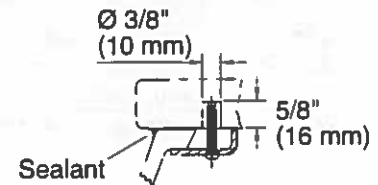
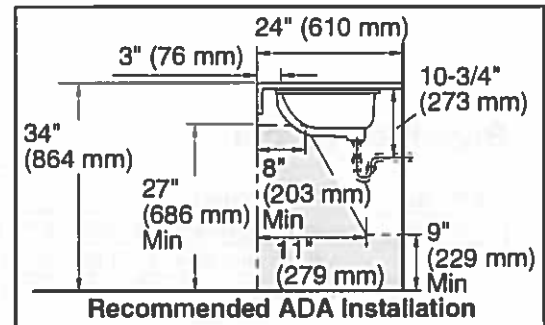
Install this product according to the installation guide.

NOTICE: Countertop manufacturer or cutter must use the current product template available at www.kohler.com, or by calling 1-800-4KOHLER. Kohler Co. is not responsible for cutout errors when the incorrect cutout template is used.

Will comply with ADA when installed per Section 606 Lavatories and Sinks of the 2010 ADA Standards for Accessible Design.

Will comply with CSA B651 when installed per Clause 4.3.3 of the standard.

Will comply with OBC when installed per Clause 3.8.3.11.



Marble Installation



Wood Installation

Product Diagram

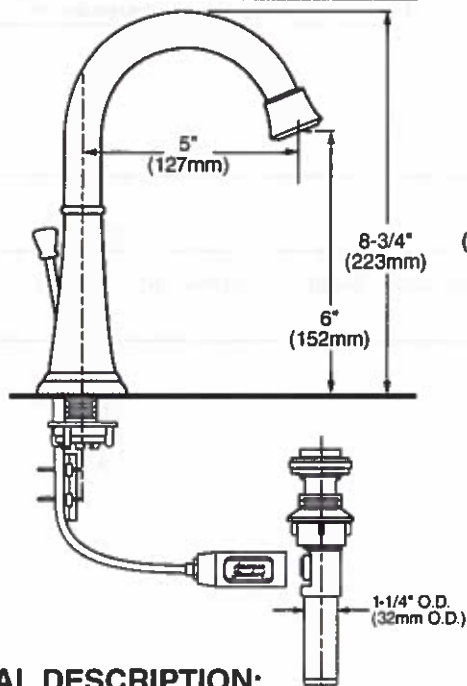
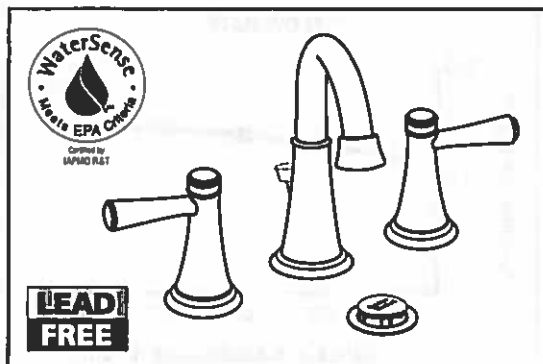
L-1 & L-2

American Standard

Style That Works Better

ROSETTA™

TWO-HANDLE WIDESPREAD LAVATORY FAUCET
FEATURES THE SPEED CONNECT® INSTALLATION SYSTEM



GENERAL DESCRIPTION:

Cast brass valve bodies with reinforced flexible hose connections for 6" to 12" (152mm to 305mm) installations. 1/4 turn washerless ceramic disc valve cartridges. Cast brass spout. One-half inch brass male inlets. 20" (500mm) long flexible stainless steel drain cable is pre-assembled to faucet body. Speed Connect® pre-assembled drain body with 1-1/4 inch (32mm) tail piece. 1.5 gpm/5.6L/min. maximum flow rate.

PRODUCT INCLUDES:

Brass Construction: Durable. Ideal for prolonged contact with water.

Ceramic Disc Valve Cartridges: Smooth handle operation and assures a lifetime of drip-free performance.

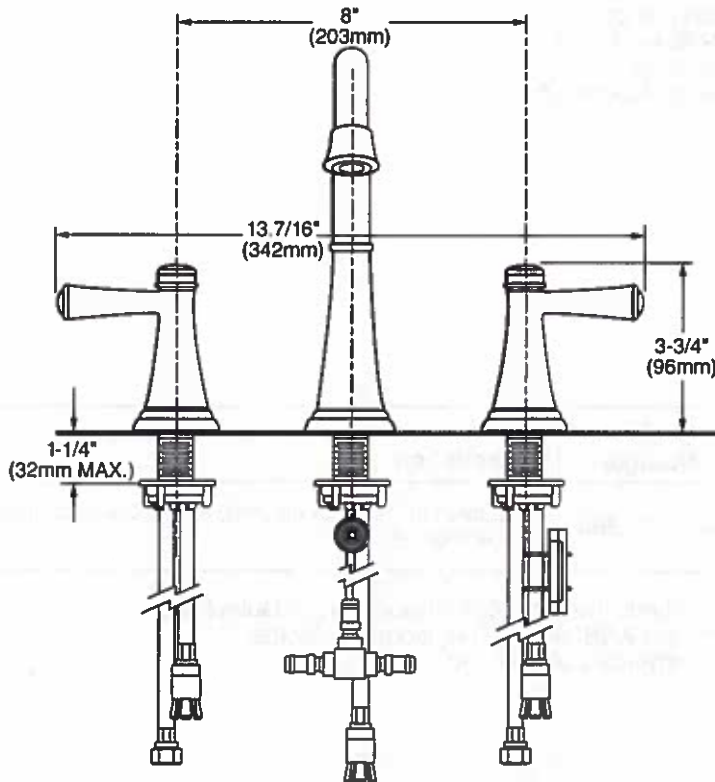
Lead Free: Faucet contains ≤ 0.25% total lead content by weighted average.

SUGGESTED SPECIFICATION:

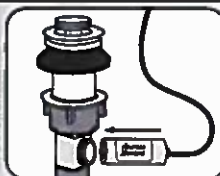
Two handle widespread lavatory faucet shall feature cast brass valve bodies with reinforced flexible hose connections for 6" to 12" installations. Shall also feature 1/4 turn washerless ceramic disc valve cartridges. Shall also feature a drain body with stainless steel cable actuation. Fitting shall be American Standard Model # 9257.801.295, SKU# 352655.

MODEL NUMBER:

- 9257.801.295 Widespread Lavatory
Speed Connect® pre-assembled drain. Lever handles.
Satin Nickel (PVD) finish. SKU# 352655.



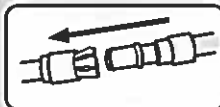
No-Tools Speed Connect® Installation System



Speed Connect® Pre-Assembled Drain:
Maintenance-Free and never needs adjusting



Speed Connect® Nuts:
Push up and hand-turn to tighten

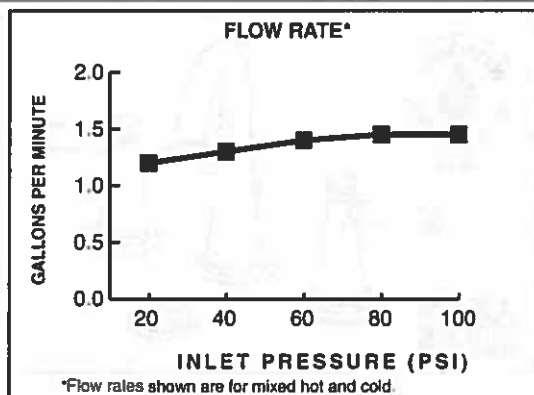


Speed Connect®:
Snap together and lock for easy, watertight connection

CODES AND STANDARDS

These products meet or exceed the following codes and standards:

- ANSI A117.1**
- ASME A112.18.1**
- CSA B 125**
- NSF 61/Section 9**



Product Number	Description
9257.801.295	Lavatory faucet. Lever handles. Speed Connect® Installation System. Satin Nickel (PVD) finish. SKU# 352655.

 Meets the American Disabilities Act Guidelines and ANSI A117.1 Requirements for the physically challenged.

L-3

American Standard

Style That Works Better

BARRIER FREE

DECLYN™ WALL-HUNG LAVATORY

VITREOUS CHINA

DECLYN™ WALL-HUNG LAVATORY

- Wall-hung sink
 - Vitreous china
 - Rear overflow
 - Soap depression
 - Faucet ledge
- Shown with 2000.101 Ceramix faucet (not included)

- 0321.026 With wall hanger (Illustrated)
Faucet holes on 102mm (4") centers
- 0321.075 For concealed arms support
Faucet holes on 102mm (4") centers

Nominal Dimensions:

470 x 432mm
(18-1/2" x 17")

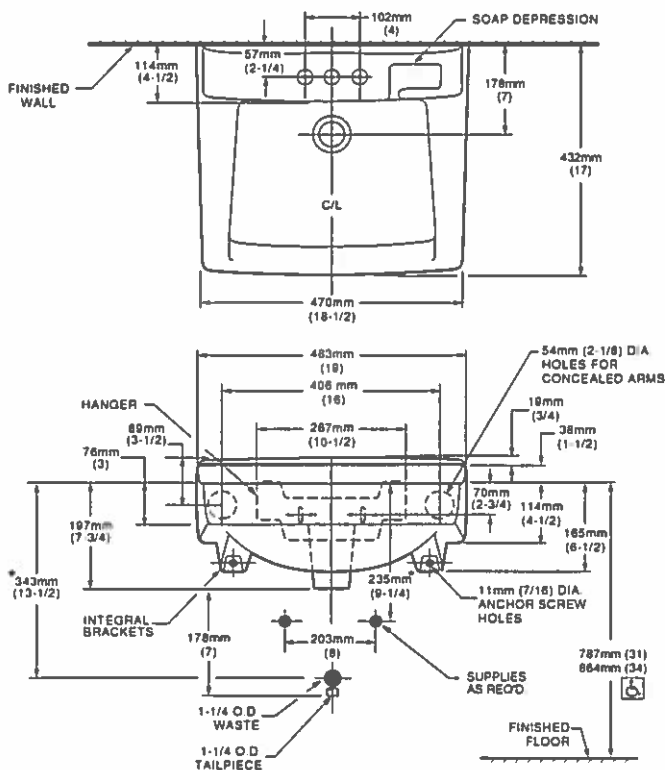
Bowl sizes:

362mm (14-1/4") wide
273mm (10-3/4") front to back
152mm (6") deep

Compliance Certifications -

Meets or Exceeds the Following Specifications:

- ASME A112.19.2 for Vitreous China Fixtures



To Be Specified:

- Color: White Bone Silver
- Faucet*:
- Faucet Finish:
- Supplies:
- 1-1/4" Trap:
- Nipple:
- Concealed Arms Support (by others):

* See faucet section for additional models available

MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES - CHECK LOCAL CODES.
Top of front rim mounted 864mm (34") from finished floor.

NOTES:
* DIMENSIONS SHOWN FOR LOCATION OF SUPPLIES AND "P" TRAP ARE SUGGESTED.
PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.
FITTINGS NOT INCLUDED AND MUST BE ORDERED SEPARATELY.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

MOEN® COMMERCIAL

Specifications

DESCRIPTION

- Metal construction with Chrome plated or Classic Brushed Nickel finish
- 1/2" IPS connections or flex supply lines (3/8" compression fittings)
- Includes metal pop-up type waste assembly or metal grid strainer where noted

OPERATION

- Pivot action lever style handle in 3" and 4"

FLOW

- Standard aerator is limited to 1.5 gpm max (5.7L/min)

CARTRIDGE

- 1255™ Duralast™ cartridge
- Nonmetallic/nonferrous and stainless steel material

STANDARDS

- Third party certified to WaterSense®, (only applies to 1.5 gpm), CSA B125.1, ASME A112.18.1 and all applicable requirements referenced therein including NSF61/9
- Contains no more than 0.25% weighted average lead content
- Complies with California Proposition 65 and with the Federal Safe Drinking Water Act

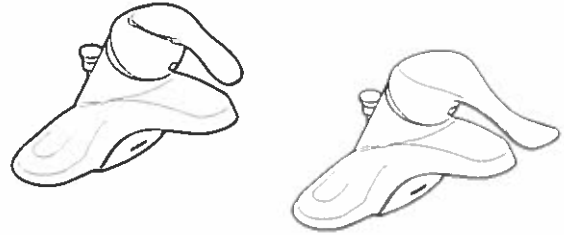
- ADA  for lever handles

WARRANTY

- Lifetime limited warranty against leaks, drips and finish defects to the original consumer purchaser
- 5 year warranty if used in commercial installations



See table above



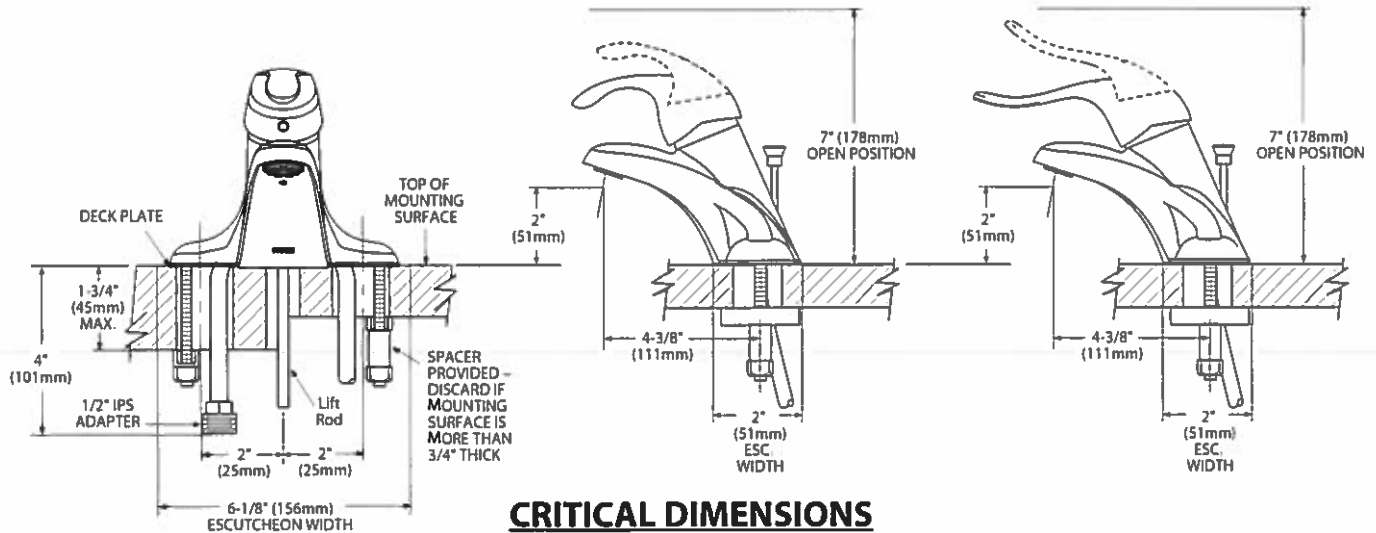
M-Bition® Single-Handle Lavatory Faucet						
MODEL	LEVER HANDLE SIZE	FLOW (gpm)	CONNECTION TYPE	DRAIN	FINISH	WATERSENSE CERTIFIED
B439	3"	1.5	Flex Supply Lines	Without	Chrome	x
B439CBN	3"	1.5	Flex Supply Lines	Without	CBN	x
B437	3"	1.5	Flex Supply Lines	Metal	Chrome	x
B437CBN	3"	1.5	Flex Supply Lines	Metal	CBN	x
B430	3"	1.5	IPS	Without	Chrome	x
B430CBN	3"	1.5	IPS	Without	CBN	x
B432	3"	1.5	IPS	Metal	Chrome	x
B434	3"	1.5	IPS	Grid	Chrome	x
B439F05	3"	0.5	Flex Supply Lines	Without	Chrome	
B430F05	3"	0.5	IPS	Without	Chrome	
B430F03	3"	0.35	IPS	Without	Chrome	
B422	4"	1.5	Flex Supply Lines	Without	Chrome	x
B422CBN	4"	1.5	Flex Supply Lines	Without	CBN	x
B400	4"	1.5	IPS	Without	Chrome	x
B420	4"	1.5	IPS	Metal	Chrome	x
B420CBN	4"	1.5	IPS	Metal	CBN	x
B425	4"	1.5	IPS	Grid	Chrome	x
B422F05	4"	0.5	Flex Supply Lines	Without	Chrome	
B422F03	4"	0.35	Flex Supply Lines	Without	Chrome	

CBN-Classic Brushed Nickel

NOTE: This faucet is designed to be installed thru 3-1" dia. holes, 2" on center

3" Handle Version

4" Handle Version



CRITICAL DIMENSIONS

(DO NOT SCALE)

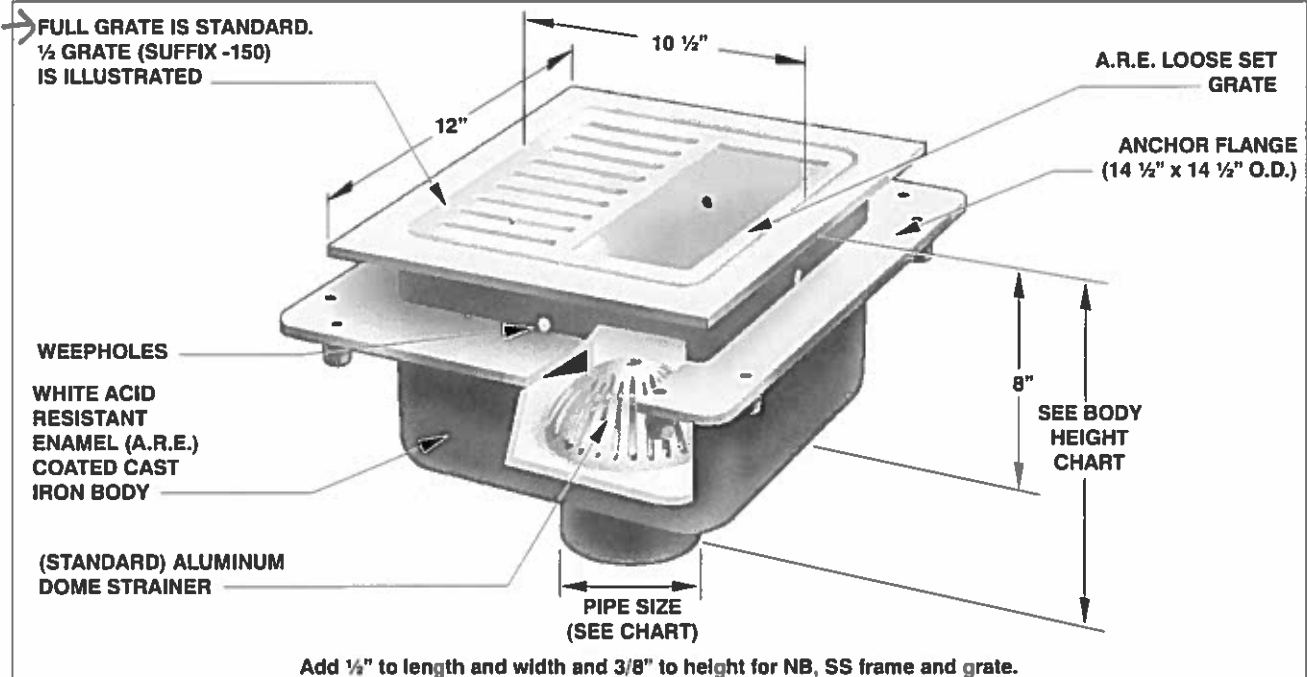
FS-1

Location: _____

MIFAB® FS1730-FL 12" x 12" x 8" FLOOR AREA AND INDIRECT SANITARY WASTE DRAIN WITH FLANGE

Specification: MIFAB Series FS1730-FL, 12" x 12" x 8" deep cast iron floor area and indirect sanitary waste drain complete with white acid resistant porcelain enamel coated interior, loose set grate and anchor flange with weepholes. Anti-splash aluminum dome strainer included.

Function: Used in kitchens, restaurants, grocery stores, hospitals, schools, and other areas that require a large volume sanitary drain. Also suitable for indirect waste applications. The anchor flange is engineered to receive water proofing membrane. Membrane clamps are recommended for use with the anchor flange (Suffix -C). The light duty grate is not recommended for foot traffic.



PIPE SIZE	BODY HEIGHT				
	NO HUB (STANDARD)	PUSH ON (P)	THREADED (T)	INSIDE CAULK (X)	PVC/ABS (-30)/(-31)
2" (51) ○	<input type="checkbox"/> *10 1/2" (267)	<input type="checkbox"/> *10 7/8" (276)	<input type="checkbox"/> *10 1/2" (267)	<input type="checkbox"/> *12" (305)	<input type="checkbox"/> *11 1/4" (286)
3" (76) ○	<input type="checkbox"/> *10 1/2" (267)	<input type="checkbox"/> *10 7/8" (276)	<input type="checkbox"/> *10 7/8" (276)	<input type="checkbox"/> *12" (305)	<input type="checkbox"/> *11 1/4" (286)
4" (102) ○	<input type="checkbox"/> *10 1/2" (267)	<input type="checkbox"/> 9 3/4" (248)	<input type="checkbox"/> *10 7/8" (276)	<input type="checkbox"/> 10 5/8" (270)	<input type="checkbox"/> *11 1/4" (286)

*Indicates outlet size and connection available with transition outlet body only Outlet sizes indicated by the * are available with the transition outlet body only

- | | | | |
|--|---|-------------------------------------|--|
| SUFFIX | OPTIONAL VARIATIONS: | SUFFIX | SUFFIX |
| <input type="checkbox"/> -1 | Nickel bronze frame and grate | <input type="checkbox"/> -32 | Deep seal trap with flushing connection |
| <input type="checkbox"/> -3 | Stainless steel frame and grate | <input type="checkbox"/> -50 | A.R.E. coated cast iron funnel |
| <input type="checkbox"/> -5 | Sediment bucket | <input type="checkbox"/> -51 | 2 1/2" round center hole in grate (-1, -3 only) |
| <input type="checkbox"/> -6 | Security screws (1, -3 only, T-20 Torx and pin) | <input type="checkbox"/> -69 | Stainless steel sediment bucket |
| <input type="checkbox"/> -7 | 1/2" trap seal primer connection | <input type="checkbox"/> -83 | Stainless steel mesh screen over sediment bucket |
| <input type="checkbox"/> -8 | Backwater valve | <input type="checkbox"/> -90 | Threaded side outlet |
| <input type="checkbox"/> -9 | Hinged grate (-1, -3 only) | <input type="checkbox"/> -90NH | No hub side outlet |
| <input type="checkbox"/> -21 | Secondary flat stainless steel strainer | <input type="checkbox"/> -95 | Client logo (-1, -3 only) |
| <input type="checkbox"/> -22 | Less grate | <input type="checkbox"/> -150 | 1/2" grate |
| see FS1930-FL <input type="checkbox"/> | Stainless steel body (Type 304) | <input type="checkbox"/> -175 | 3/4" grate |
| see FS1930-FL <input type="checkbox"/> | Stainless steel body (Type 316) | | |
| <input type="checkbox"/> -30 | PVC outlet | | |
| <input type="checkbox"/> -31 | ABS outlet | | |
| | | <input type="checkbox"/> -BA | Buy American Act compliant product |
| | | <input type="checkbox"/> (Standard) | No hub outlet |
| | | <input type="checkbox"/> -F4 | 4" round funnel |
| | | <input type="checkbox"/> -F6 | 6" round funnel |
| | | <input type="checkbox"/> -G | 4" x 9" oval funnel |
| | | <input type="checkbox"/> -J | 3" x 1" oval funnel |
| | | <input type="checkbox"/> P | Push on outlet |
| | | <input type="checkbox"/> -PA | Pennsylvania Steel Act compliant product |
| | | <input type="checkbox"/> T | Threaded outlet |
| | | <input type="checkbox"/> X | Inside caulk outlet |
| | | <input type="checkbox"/> -Z | Extended wide elastomeric flange (with -FL only) |

Job Name: _____ Page No: _____

Section No: _____ Contractor: _____

Schedule No: _____ Purchase Order No: _____

Location: _____

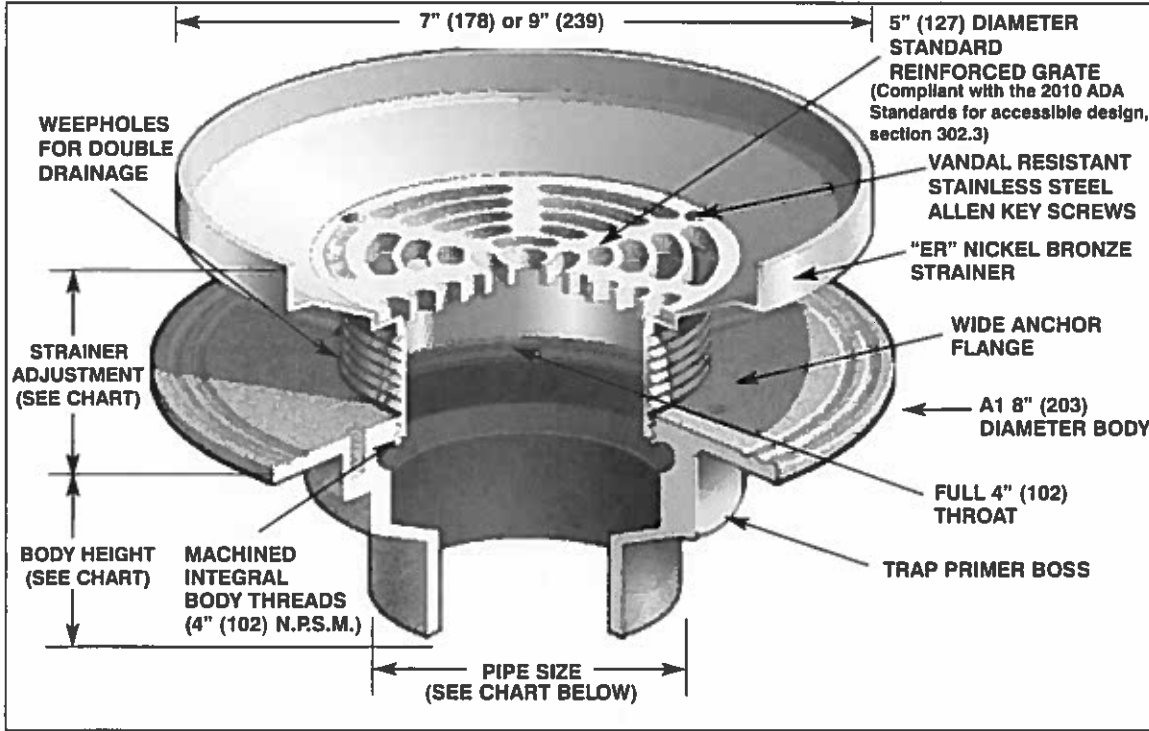


F1100-ER

EXTENDED RIM FLOOR DRAIN FOR NON-MEMBRANE FLOOR AREAS

Specification: MIFAB Series F1100-ER-(*)-1 lacquered cast iron floor drain with anchor flange, weepholes, and extended rim (specify diameter), satin finished nickel bronze strainer with vandal resistant, stainless steel allen key screws. (For membrane floors, use MIFAB F1100-C-ER Series.)

Function: Used in restaurants, hospitals, industrial laboratories, and other non-membrane finished areas where indirect waste lines above the floor drip condensate or waste water and there is no room for a funnel. The extended rim permits use as an anti-flood and anti splash drip pan.



PARTS:



A1 BODY



ER-(*)
(*) Denotes Strainer Finish (-1, -3 or -50)

F1100-ER Series meets ANSI-ASME floor drain standard A112.6.3-2001

STRAINER DIAMETER	STRAINER ADJUSTMENT		PIPE SIZE	BODY HEIGHT				
	MIN	MAX		NO HUB (STANDARD)	PUSH ON (P)	THREADED (T)	INSIDE CAULK (X)	PVC/ABS (-30)/(-31)
7" (178)	1 3/4" (44)	2 5/8" (67)	2" (51) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 1/4" (57) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	2 15/16" (75) <input type="checkbox"/>
9" (229)	1 3/4" (44)	2 5/8" (67)	3" (76) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>
			4" (102) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>
			5" (127) ○	3" (76) <input type="checkbox"/>	— <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	— <input type="checkbox"/>
			6" (152) ○	3 1/4" (83) <input type="checkbox"/>	6 1/2" (165) <input type="checkbox"/>	— <input type="checkbox"/>	— <input type="checkbox"/>	— <input type="checkbox"/>

- SUFFIX**
- 1 Nickel bronze strainer and rim (standard)
 - 3 Stainless steel strainer and rim
 - 5 Sediment bucket
 - 6 Security screws (T-20 Torx & pin)
 - 7 1/2" trap seal primer connection
 - 8 Backwater valve (2", 3", 4")
 - 11 Acid resistant epoxy coated body
 - 13 Galvanized body
 - 15 Extension
 - 21 Secondary flat stainless steel strainer (2", 3", 4")
 - 28 Stainless steel body (Type 304)

- SUFFIX**
- 30 PVC socket connection body
 - 31 ABS socket connection body
 - 34 Closure plug
 - 40 Underdeck clamp
 - 41 Sump receiver
 - 50 Lacquered cast iron funnel for unfinished areas
 - 90 Threaded side outlet (2", 3", 4") (cast iron only)
 - 90NH No hub side outlet (2", 3", 4") (cast iron only)
 - 95 Client logo
 - ARRA ARRA (Stimulus Act) compliant product

- SUFFIX**
- BA Buy American Act compliant product
 - C Membrane Clamp
 - C1 Clamp ring for low rough-in (min. 1/2" (13))
 - (Standard) No hub outlet
 - P Push on outlet
 - PA Pennsylvania Steel Act compliant product
 - T Threaded outlet (2", 3", 4")
 - X Inside caulk outlet
 - Z Extended wide elastomeric flange

Job Name: _____ Page No: _____
 Section No: _____ Contractor: _____
 Schedule No: _____ Purchase Order No: _____

MIFAB reserves the right to make changes in material and design without formal notice and obligation.

FD-1

Location: _____

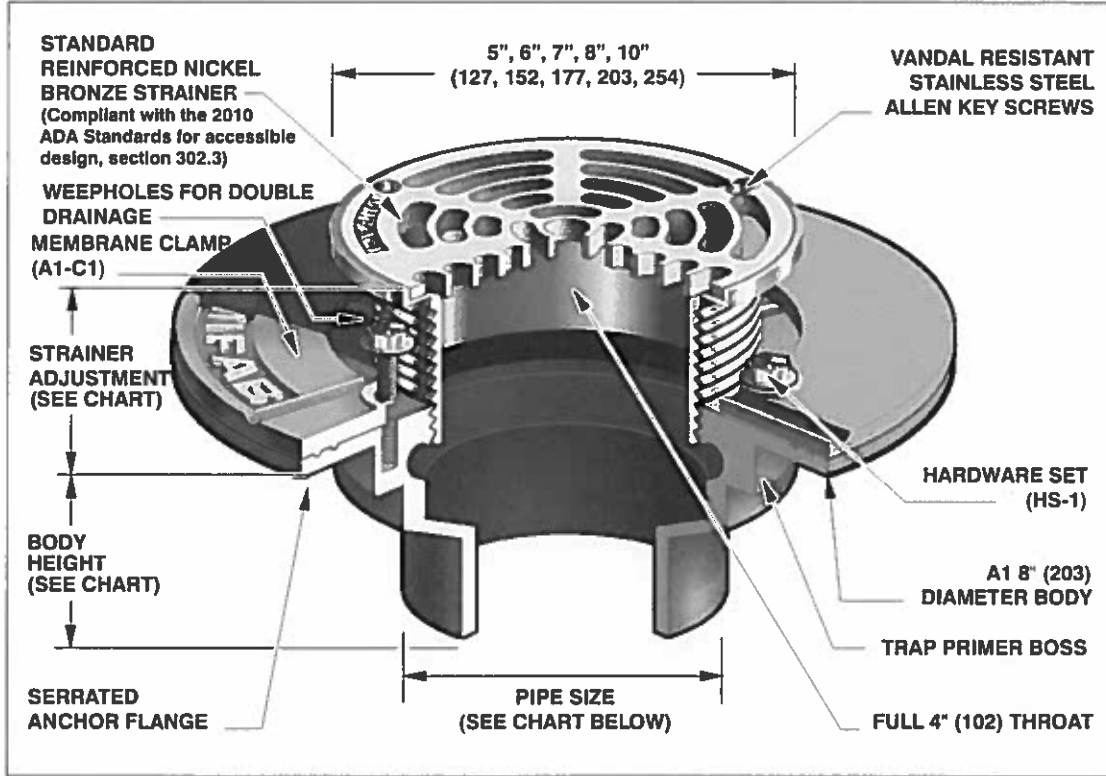


F1100-C

FLOOR DRAIN FOR MEMBRANE FLOOR AREAS

Specification: MIFAB® Series F1100-C (*)-1 (* specify strainer diameter) lacquered cast iron floor drain with anchor flange, cast iron membrane clamp ring with primary and secondary weepholes for waterproofing membrane, and standard satin finished nickel bronze strainer with vandal resistant stainless steel all on key screws (For non-membrane floors, delete -C from Series number).

Function: Used in showers, kitchens, restrooms, and other membrane finished areas. Round adjustable strainer is used for all types of poured finished floors.



PARTS:

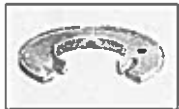


A1 BODY



A1-C1

(*)-(**)
 (*) Denotes Strainer Size (5", 6", 7", 8", 10")
 (**) Denotes Strainer Finish (-1, -3 or -4)



HS-1



HS-1

F1100-C Series meets ANSI/ASME floor drain standard A112.6.3-2001

STRAINER DIAMETER	STRAINER ADJUSTMENT		ANSI/ASME RATING		PIPE SIZE	BODY HEIGHT				
	MIN	MAX	FREE AREA	LOAD RATING N.B. (-1) D.I. (-4)		NO HUB (STANDARD)	PUSH ON (P)	THREADED (T)	INSIDE CAULK (X)	PVC/ABS (-30)/(-31)
5" (127) ○	1/2" (38)	1 1/2" (38)	8 in² (5200²)	UP TO 2000 LBS. 5000 TO 7499 LBS.	2" (51) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 1/4" (57) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	2 15/16" (75) <input type="checkbox"/>
6" (152) ○	1 1/16" (17)	1 1/2" (38)	9 in² (5800²)	UP TO 2000 LBS. 5000 TO 7499 LBS.	3" (76) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>
7" (177) ○	9/16" (14)	1 9/16" (40)	12 in² (7700²)	UP TO 2000 LBS. 5000 TO 7499 LBS.	4" (102) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>
8" (203) ○	1 1/16" (17)	2 1/4" (57)	18 in² (11600²)	UP TO 2000 LBS. OVER 10000 LBS.	5" (127) ○	3" (76) <input type="checkbox"/>	- <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	- <input type="checkbox"/>
10" (254) ○	1 1/16" (17)	2 1/4" (57)	26 in² (17170²)	UP TO 2000 LBS. -	6" (152) ○	3 1/4" (83) <input type="checkbox"/>	6 1/2" (165) <input type="checkbox"/>	- <input type="checkbox"/>	- <input type="checkbox"/>	- <input type="checkbox"/>

SUFFIX

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 11
- 13
- 15
- 21
- 28

OPTIONAL VARIATIONS:

- Nickel bronze strainer (standard)
- Polished brass strainer (5" only)
- Stainless steel strainer
- Ductile iron strainer (5", 8" only)
- Sediment bucket
- Security screws (T-20 Torx & pin)
- 1/2" trap seal primer connection
- Backwater valve (2", 3", 4")
- Acid resistant epoxy coated body
- Galvanized
- Extension
- Secondary flat stainless steel strainer (2", 3", 4")
- Stainless steel body (Type 304)

SUFFIX

- 30
- 31
- 34
- 40
- 41
- 49
- 50
- 90
- 90NH
- 95
- ARRA
- C1
- BA

- PVC socket connection body
- ABS socket connection body
- Closure plug
- Underdeck clamp
- Sump receiver
- Chrome plated strainer
- Lacquered cast iron funnel
- Threaded side outlet (2", 3", 4")
- No hub side outlet (2", 3", 4")
- Client logo
- ARRA (Stimulus Act) compliant product
- Low rough-in membrane clamp (min. 1/2" (13))
- Buy American Act compliant product

SUFFIX

- F4
- F6
- G
- HP
- J
- (Standard)
- P
- PA
- T
- X
- Z

- 4" Round funnel
- 6" Round funnel
- Oval 4" x 9" funnel
- Heel proof grate (1/4" maximum grate opening size, -3 only)
- 3" x 1" funnel
- No hub outlet
- Push on outlet
- Pennsylvania Steel
- Act compliant product
- Threaded outlet (2", 3", 4")
- Inside caulk outlet
- Extended wide elastomeric flange

Job Name: _____
 Section No: _____
 Schedule No: _____

Page No: _____
 Contractor: _____
 Purchase Order No: _____

MIFAB reserves the right to make changes in material and design without formal notice and obligation.

Location: _____

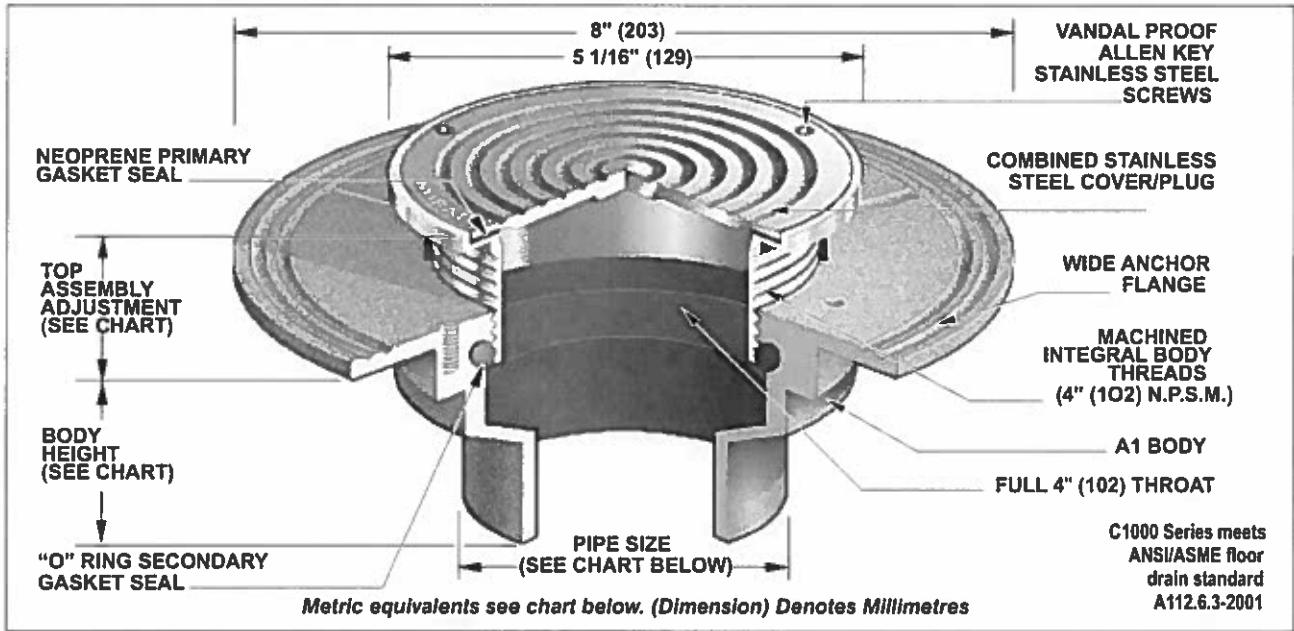


C1000

STAINLESS STEEL FLOOR CLEANOUT WITH HEAVY DUTY ADJUSTABLE COVER AND PLUG

Specification: MIFAB C1000 Series (specify top assembly design) adjustable floor cleanout with lacquered cast iron body and anchor flange, secondary "O" ring Test Seal, 4" diameter cleanout opening and heavy duty cast stainless steel scoriated combined cover and plug top assembly with stainless steel vandal proof allen key screws and primary gasket seal. (For membrane floors, add Suffix -C for membrane clamp.)

Function: Used in finished floors to provide emergency access to the plumbing lines for removal of blockages. Replacement of the surface level cover/plug with the neoprene gasket glued to the underside provides visual evidence that the cleanout has been properly resealed to prevent harmful sewer gases from entering the building. Heavy duty, cast, Type 304 stainless steel cover and plug ensures long life.



TOP ASSEMBLY DIAMETER	TOP ASSEMBLY ADJUSTMENT		ANSI/ASME RATING LOAD RATING		PIPE SIZE	BODY HEIGHT				
	MIN	MAX	S.S. (-3)	D.I. (-4)		NO HUB (STANDARD)	PUSH ON (P)	THREADED (T)	INSIDE CAULK (X)	PVC/ABS (-30)/(-31)
5" (127)	1/2" (13)	1 1/4" (32)	5,000 to 7,499 LBS.	SPECIAL DUTY OVER 10,000 LBS.	2" (51) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 1/4" (57) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	2 15/16" (75) <input type="checkbox"/>
					3" (76) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>
					4" (102) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>
					5" (127) ○	3" (76) <input type="checkbox"/>	—	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	—
					6" (152) ○	3 1/4" (83) <input type="checkbox"/>	6 1/2" (165) <input type="checkbox"/>	—	—	—

<input type="checkbox"/> -3	OPTIONAL VARIATIONS:	<input type="checkbox"/> -90NH	No hub side outlet (2", 3", 4") (cast iron only)	<input type="checkbox"/> -RCF	Stainless steel carpet flange cover (-1 or -3 only)
<input type="checkbox"/> -4	Heavy duty stainless steel top assembly	<input type="checkbox"/> -95	Special marking etched into top (SAN for sanitary or GW for Grease Waste)	<input type="checkbox"/> -S	Square top assembly (-1 or -3 only) (5" x 5")
<input type="checkbox"/> -6	Extra heavy duty ductile iron top assembly for unfinished areas	<input type="checkbox"/> -ARRA	ARRA (Stimulus Act) compliant product	<input type="checkbox"/> -T	Round top assembly recessed 1/8" for tile
<input type="checkbox"/> -6S	Security screws (TR25 Torx & pin)	<input type="checkbox"/> -BA	Buy American Act compliant product	<input type="checkbox"/> T	Threaded outlet (2", 3", 4")
<input type="checkbox"/> -11	6" x 6" square top assembly (-1 or -3 only)	<input type="checkbox"/> -C	Membrane clamp	<input type="checkbox"/> -TS	Square top assembly recessed 1/8" for tile (-1 or -3 only)
<input type="checkbox"/> -13	Acid resistant epoxy coated body	<input type="checkbox"/> (Standard)	No hub outlet	<input type="checkbox"/> -UR	Round top assembly recessed 1 1/4" for terrazo (-1 or -3 only)
<input type="checkbox"/> -15	Galvanized body	<input type="checkbox"/> P	Push on outlet	<input type="checkbox"/> -US	Square top assembly recessed 1 1/4" for terrazo (-1 or -3 only)
<input type="checkbox"/> -28	Extension	<input type="checkbox"/> -PA	Pennsylvania Steel Act compliant product	<input type="checkbox"/> X	Inside caulk outlet
<input type="checkbox"/> -30	Stainless steel body (Type 304)	<input type="checkbox"/> -R	Round top assembly	<input type="checkbox"/> -Z	Extended wide elastomeric flange
<input type="checkbox"/> -31	PVC socket connection body	<input type="checkbox"/> -RC	Stainless steel carpet maker		
<input type="checkbox"/> -34	ABS socket connection body				
<input type="checkbox"/> -34	Secondary closure plug				
<input type="checkbox"/> -90	Threaded side outlet (2", 3", 4") (cast iron only)				

Job Name: _____ Page No: _____
 Section No: _____ Contractor: _____
 Schedule No: _____ Purchase Order No: _____

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FCU

Location: _____

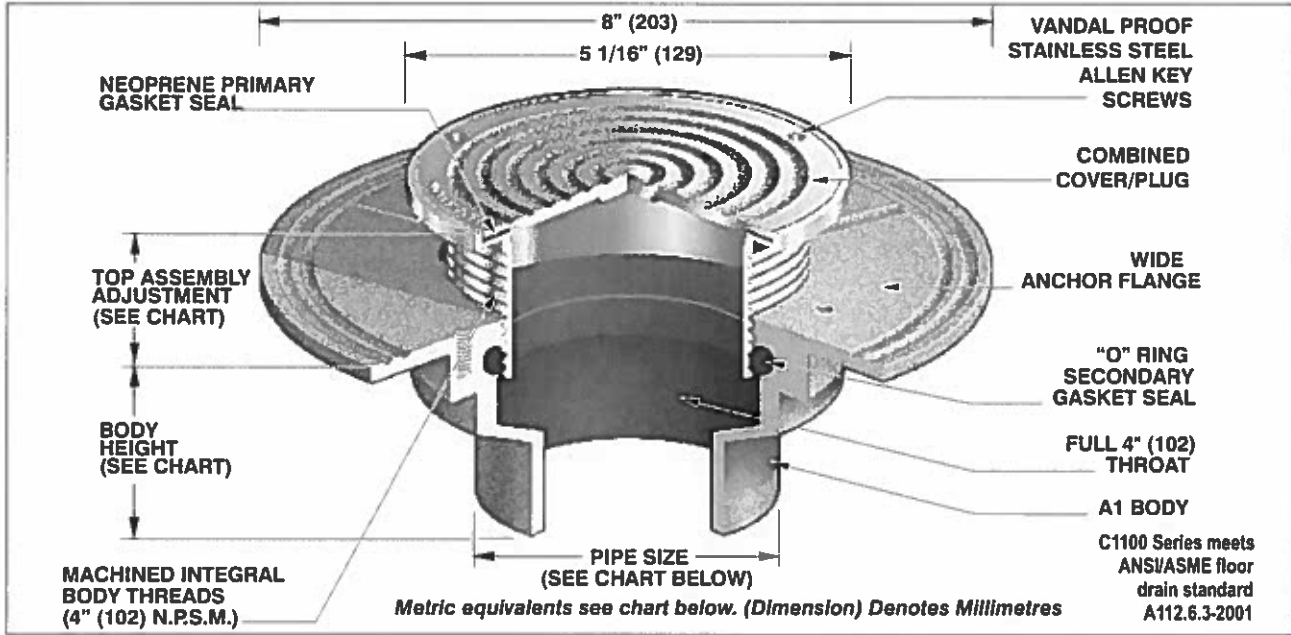


C1100

FLOOR CLEANOUT WITH ADJUSTABLE COVER AND PLUG

Specification: MIFAB C1100 Series (specify top assembly design) adjustable floor cleanout with lacquered cast iron body and anchor flange, secondary "O" ring Test Seal, 4" diameter cleanout opening and scoriated combined cover and plug top assembly (specify material type) with stainless steel vandal proof allen key screws and primary gasket seal. (For membrane floors, add Suffix -C for membrane clamp.)

Function: Used in finished floors to provide emergency access to the plumbing lines for removal of blockages. Replacement of the surface level cover/plug with the neoprene gasket glued to the underside provides visual evidence that the cleanout has been properly resealed to prevent harmful sewer gases from entering the building.



TOP ASSEMBLY DIAMETER	TOP ASSEMBLY ADJUSTMENT		ANSI/ASME RATING LOAD RATING			PIPE SIZE	BODY HEIGHT					
	MIN	MAX	N.B. (-1)	S.S. (-3)	D.I. (-4)		NO HUB (STANDARD)	PUSH DN (P)	THREADED (T)	INSIDE CAULK (X)	PVC/ABS (-30)/(-31)	
5" (127)	1/2" (13)	1 1/4" (32)	UP TO 4,999 LBS.	5,000 TO 7,499 LBS.	SPECIAL DUTY OVER 10,000 LBS.	2" (51) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 1/4" (57) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	2 15/16" (75) <input type="checkbox"/>	
						3" (76) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	
						4" (102) ○	3" (76) <input type="checkbox"/>	3 3/8" (86) <input type="checkbox"/>	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	
						5" (127) ○	3" (76) <input type="checkbox"/>	-	2 5/8" (67) <input type="checkbox"/>	3 3/4" (95) <input type="checkbox"/>	-	-
						6" (152) ○	3 1/4" (83) <input type="checkbox"/>	6 1/2" (165) <input type="checkbox"/>	-	-	-	-

<input type="checkbox"/> -1 Nickel bronze top assembly	<input type="checkbox"/> -90NH No hub side outlet (2", 3", 4") (cast iron only)	<input type="checkbox"/> -RCF Stainless steel carpet flange cover (-1 or -3 only)
<input type="checkbox"/> -3 Heavy duty stainless steel top assembly	<input type="checkbox"/> -95 Special marking etched into top (SAN for sanitary or GW for Grease Waste)	<input type="checkbox"/> -S Square top assembly (-1 or -3 only) (5" x 5")
<input type="checkbox"/> -4 Extra heavy duty ductile iron top assembly for unfinished areas	<input type="checkbox"/> -ARRA ARRA (Stimulus Act) compliant product	<input type="checkbox"/> -T Round top assembly recessed 1/8" for tile
<input type="checkbox"/> -6 Security screws (TR25 Torx & pin)	<input type="checkbox"/> -BA Buy American Act compliant product	<input type="checkbox"/> T Threaded outlet (2", 3", 4")
<input type="checkbox"/> -6S 6" x 6" square top assembly (-1 or -3 only)	<input type="checkbox"/> -C Membrane clamp	<input type="checkbox"/> -TS Square top assembly recessed 1/8" for tile (-1 or -3 only)
<input type="checkbox"/> -11 Acid resistant epoxy coated body	<input type="checkbox"/> (Standard) No hub outlet	<input type="checkbox"/> -UR Round top assembly recessed 1 1/4" for terrazzo (-1 or -3 only)
<input type="checkbox"/> -13 Galvanized body	<input type="checkbox"/> P Push on outlet	<input type="checkbox"/> -US Square top assembly recessed 1 1/4" for terrazzo (-1 or -3 only)
<input type="checkbox"/> -15 Extension	<input type="checkbox"/> -PA Act compliant product	<input type="checkbox"/> X Inside caulk outlet
<input type="checkbox"/> -28 Stainless steel body (Type 304)	<input type="checkbox"/> -R Round top assembly	<input type="checkbox"/> -XR Heavy duty round top assembly
<input type="checkbox"/> -30 PVC socket connection body	<input type="checkbox"/> -RC Stainless steel carpet maker	<input type="checkbox"/> -XS Heavy duty square top assembly
<input type="checkbox"/> -31 ABS socket connection body		<input type="checkbox"/> -Z Extended wide elastomeric flange
<input type="checkbox"/> -34 Secondary closure plug		
<input type="checkbox"/> -90 Threaded side outlet (2", 3", 4") (cast iron only)		

Job Name: _____
 Section No: _____
 Schedule No: _____

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MIFAB reserves the right to make changes in material and design without formal notice and obligation.

USA: 1-800-465-2736 www.mifab.com CAN: 1-800-387-3880



ProMax®

TALL, SHORT AND LOWBOY (TOP CONNECT) MODELS AVAILABLE

DYNACLEAN™ DIFFUSER DIP TUBE

Helps reduce lime and sediment buildup while maximizing hot water output. Made from long-lasting PEX cross-linked polymer.

COREGARD™ ANODE ROD

Aluminum anode with stainless steel core protects tank against corrosion longer than ordinary steel anodes.

DURABLE, TAMPER-RESISTANT BRASS DRAIN VALVE

PERMAGLAS® GLASS COATING

Protects steel tank from corrosion and maximizes tank life.

CSA/ASME CERTIFIED T&P RELIEF VALVE

Top-mounted T&P Relief Valve available as option on select models.

CODE COMPLIANCE:

Meets the Federal Energy Efficiency Standards according to the current edition of the National Appliance Energy Conservation Act (NAECA) of 1992. And also Meets the standby loss requirements of the U. S. Department of Energy and Current Edition of ASHRAE/IESNA 90.1 and ICC and HUB Standards.

CERTIFIED TO UL 174 FOR HOUSEHOLD ELECTRIC WATER HEATERS

6-YEAR LIMITED TANK AND PARTS WARRANTY

For complete information consult written warranty or A. O. Smith

UPGRADE TANK WARRANTY TO 10 YEARS

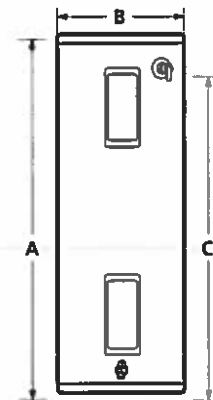
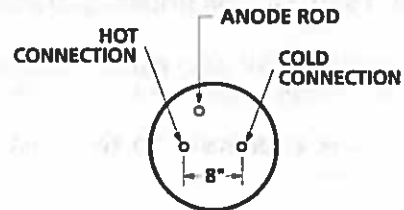
See details on page 2.



ProMax®

MODEL NUMBER	GAL. CAP.	FIRST HOUR RATING GALLONS	ENERGY FACTOR	ELEMENT WATTAGE 240 VAC		RECOVERY 90°F RISE GALLON PER HOUR	R VALUE	DIMENSIONS IN INCHES			APPROX. SHIPPING WEIGHT (LBS)	
				STANDARD	MAXIMUM			A	B	C		
TALL MODELS												
ECT-30	200	43	.93	30	4500	6000	21	16	46-1/2	18	39-1/2	90
ECT-40	200	52	.92	40	4500	6000	21	16	59-1/2	18	53-1/2	106
ECT-52	210	60	.91	50	4500	6000	21	16	54	20	47-1/2	116
ECT-55	210	67	.90	55	4500	6000	21	16	60-1/4	20	52-3/4	134
ECT-66	210	72	.88	66	4500	6000	21	16	60-1/4	20-1/2	53	178
ECT-80	210	81	.86	80	4500	6000	21	16	60-1/2	22-1/2	52	208
ECT-120*	200	112	.81	119	4500	6000	21	16	64-1/4	28	54-1/4	336
SHORT MODELS												
ECS-30	200	43	.93	30	4500	6000	21	16	36-1/2	20-1/2	28	90
ECS-40	200	52	.92	40	4500	6000	21	16	44	20-1/2	37-3/4	103
ECS-50	210	60	.90	50	4500	6000	21	16	48	21-1/2	40-1/2	121
LOWBOY MODELS												
ECL-30	200	40	.93	28	4500	6000	21	16	30	22	22-1/2	91
ECLB-30*	100	40	.93	28	4500	6000	21	12	30	20	22-1/2	90
ECLN-40	200	48	.92	38	4500	6000	21	12	31-1/4	23	24-5/8	113
ECLB-40*	200	48	.93	38	4500	6000	21	16	32-1/4	24	24-5/8	118
ECL-50	200	55	.91	50	4500	6000	21	16	34	26-1/2	25	164

Recovery capacity is based on actual performance tests.
 For 10-year tank warranty, change "E" to "P" in model number (PCT-40).
 + This model is not available with top T&P Valve.
 10-year tank warranty and top T&P Valve option combo not available on ECLN-40 and ECL-50.
 *Heater ships with supplied insulation blanket

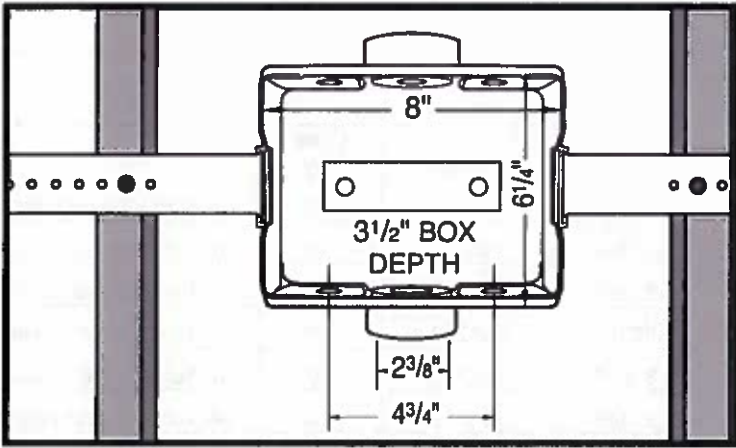
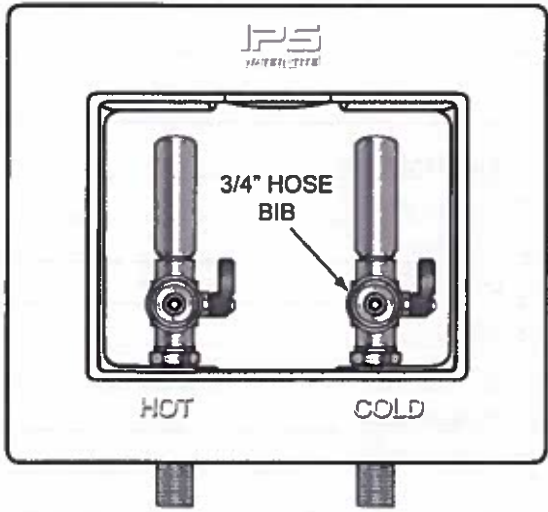


ECT, ECS, ECL(N)

SPECIFICATION SUBMITTAL SHEET

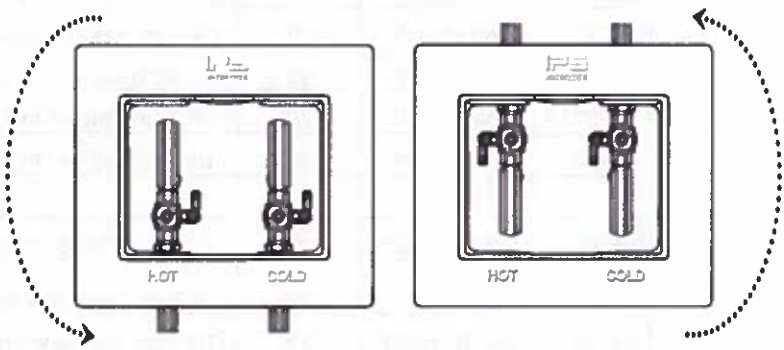
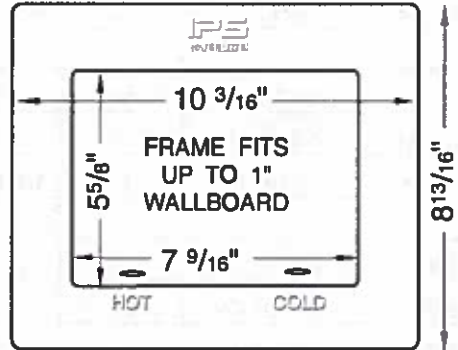


Center Drain Econo Box



SPECIFICATIONS

Furnish and install recessed Center Drain Econo Box. Unit may come with or without ASSE Certified to ANSI/ASSE 1010-2004 Standard Hammer Arresters. Box may be inverted for top mount valve/center drain connection. Unit shall be Water-Tite product code checked below with appropriate 1/4 turn or single lever brass valve connection as manufactured by IPS Corporation in Collierville, TN.



PRODUCT #	MODEL #	DESCRIPTION
82064	W4700	Brass 1/4 Turn Valves - 1/2" Sweat Conx.



www.ipscorp.com watertite@ipscorp.com

500 Distribution Parkway, Collierville, TN 38017, USA ■ TEL: 901-853-5001 ■ WATS: 800-888-8312 ■ FAX: 901-853-5008

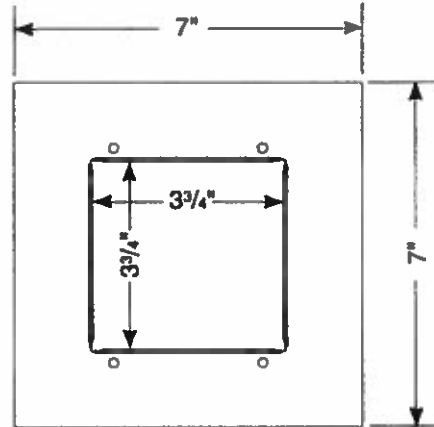
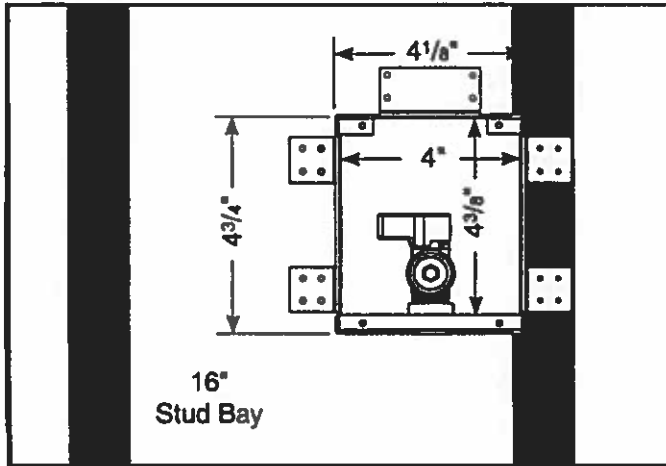


Econo Drain Center Drain Outlet Box Specification Sheet

Item #	Model #	Case Qty	Standard Pack
82064	W4700	10	1/4 Turn Valves* Installed - 1/2" Sweat Conx.
82066	W4701	10	1/4 Turn Valves* Installed - 1/2" CPVC Conx.
82068	W4702	10	1/4 Turn Valves* Installed - 1/2" PEX Conx.
82072	W4738	10	1/4 Turn Valves* Installed - 3/8" PEX Conx.
82070	W4703	10	1/4 Turn Valves* Installed - 1/2" KITEC® Conx.
82166	W4705	10	1/4 Turn Valves* Installed - 1/2" Rehau® Conx.
82003	W4711	10	1/4 Turn Valves* Installed - 1/2" Wirsbo® Conx.
87204	W4012	10	Washer Box Only - No Valves
Hammer Arrester Standard Pack			
85708	W4700 HA	10	1/4 Turn Valves* w/Arresters - 1/2" Sweat Conx.
85711	W4701 HA	10	1/4 Turn Valves* w/Arresters Installed - 1/2" CPVC Conx
85716	W4702 HA	10	1/4 Turn Valves* w/Arresters Installed - 1/2" PEX Conx.
Contractor Pack			
82065	W4700 CP	20	1/4 Turn Valves* Installed - 1/2" Sweat Conx.
82067	W4701 CP	20	1/4 Turn Valves* Installed - 1/2" CPVC Conx.
82069	W4702 CP	20	1/4 Turn Valves* Installed - 1/2" PEX Conx.
82073	W4738 CP	10	1/4 Turn Valves* Installed - 3/8" PEX Conx.
82071	W4703 CP	20	1/4 Turn Valves* Installed - 1/2" KITEC® Conx.
82167	W4705 CP	20	1/4 Turn Valves* Installed - 1/2" Rehau® Conx.
82004	W4711 CP	20	1/4 Turn Valves* Installed - 1/2" Wirsbo® Conx.
Hammer Arrester Contractor Pack			
85709	W4700 HACP	20	1/4 Turn Valves* w/Arresters Installed - 1/2" Sweat Conx.
85713	W4700 HACPLF	20	1/4 Turn Valve w/Arresters Installed - 1/2" Sweat Conx/Less Frame
85712	W4701 HACP	20	1/4 Turn Valves w/Arresters Installed - 1/2" CPVC Conx.



**METAL POWDER COATED ICE MAKER OUTLET BOX
with Quarter Turn Valves**



Specifications:

Furnish and install metal powder coated ice maker outlet box. Unit Shall be Guy Gray product code as manufactured by IPS Corporation.

Box Materials:

White Powder Coat on Cold Rolled Steel Finish
20 gauge box/20 gauge faceplate

Valve & Drain Options:

Qtr. Turn Valve kit with 1/2" MIP/Sweat, CPVC, PEX or Wirsbo connection. Valves comply with ASME A112.18.1.

Item #	Product Description	Model #	Quantity
88048	Qtr Turn Valve Installed, 1/2" Sweat Conx.	MIB 1	5
88044	Qtr Turn Valve Installed, 1/2" Sweat Conx., Cont. Pack	MIB 4	10
88050	Qtr Turn Valve Installed, 1/2" CPVC Conx.	MIB 2	5
88053	Qtr Turn Valve Installed, 1/2" PEX Conx.	MIB 3	5
88131	Qtr Turn Valve, 3/8" PEX Connection	MIB38	5
88040	Qtr Turn Valve, 1/2" Wirsbo Connection	MIB5	5
88133	Low Lead, Qtr Turn Valve, 1/2" Sweat Connection, White	MIB1AB	5
88178	Low Lead, Qtr Turn Valve, 1/2" Pex Connection, White	MIB3AB	5



HB-1

WOODFORD



Freezeless Wall Faucet Model 14

This unit offers NO anti-siphon or backflow protection.

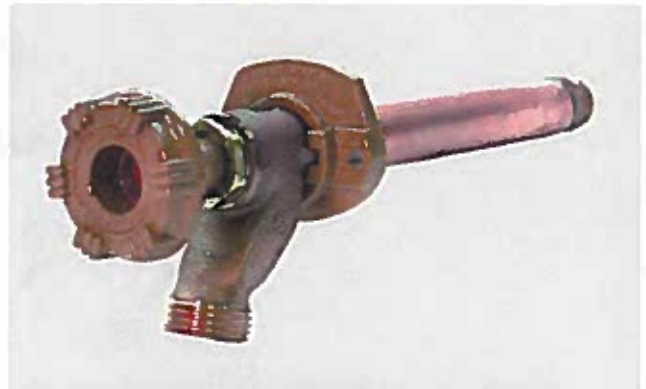
The freezeless Woodford Model 14 is designed and intended for year-round residential irrigation purposes regardless of outside temperature. This faucet will not rupture from freezing when the valve is shut off and the hose is removed.

SPECIFICATIONS:

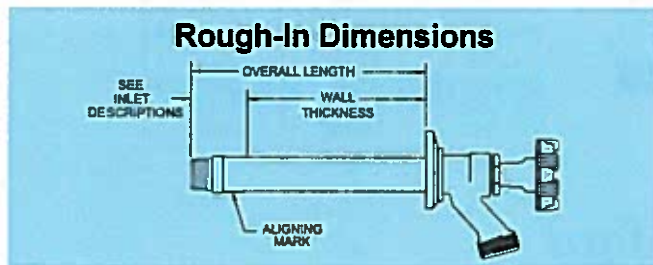
- Manufactured under one or more of the following patents: 3,208,715; 3,278,201; 5,590,679; 5,632,303
- CSA Approved

FEATURES:

- 3/4" male hose thread nozzle
- Stainless steel seat - eliminates wire draw
- EPDM packing to prevent leaking
- Full circle operating threads on valve body and retainer
- No-lead solder
- Standard "O" size seat washer
- Powder-coated, die cast aluminum handle
 - Optional Tee Key available (extra charge)
- Adjustable polycarbonate wall flange
- **MAX PRESSURE** - 125 p.s.i.
- **MAX TEMPERATURE** - 120° F



WARNING - Faucet must be installed with downward pitch toward nozzle and hose must be removed in freezing weather or faucet may freeze and burst.
Not intended for continuous use applications.



Wall Thickness (Inches)										
4	6	8	10	12	14	16	18	20	22	24
1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2

Shipping Wt. Ea. (lbs)
 *Overall Length Dimension: Add wall thickness and inlet option length shown in chart above.

For Installation / Troubleshooting Instructions go to www.woodfordmfg.com or call 1-800-621-6032

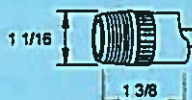
Inlet Descriptions



C Inlet COMBINATION
 Copper Sweat Fitting
 1/2" K, L or M Inside
 3/4" M Only Outside



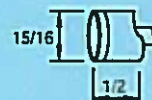
CP Inlet COMBINATION
 1/2" Male Pipe Thread
 1/2" Female Sweat



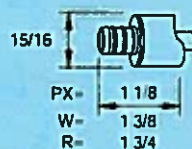
CP3 Inlet COMBINATION
 3/4" Male Pipe Thread
 3/4" Female Sweat



P Inlet COMBINATION
 1/2" Female Pipe Thread
 3/4" Male Pipe Thread



C1 INLET
 1/2" Female Sweat Fitting



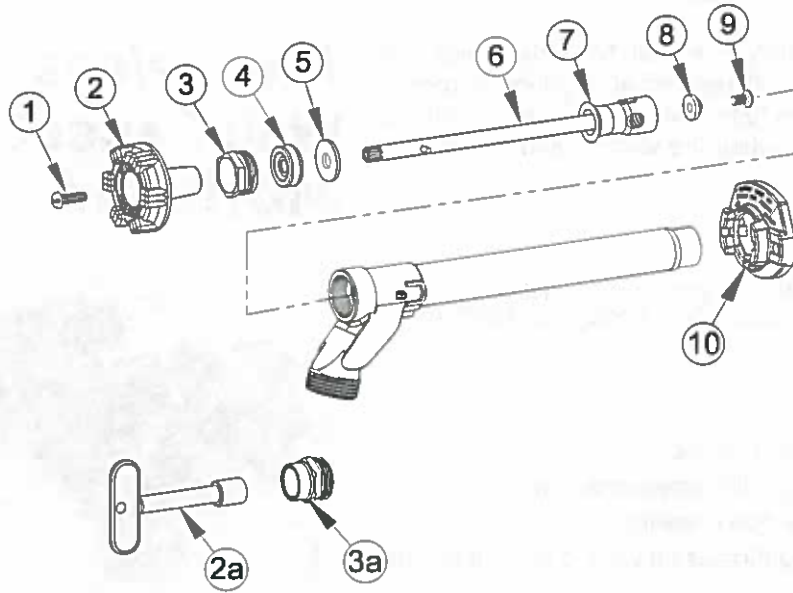
PX Inlet
 1/2" PEX Tube Fitting
PX3 INLET
 3/4" PEX Tube Fitting
W Inlet
 1/2" Wirsbo Tube Fitting
W3 INLET
 3/4" Wirsbo PEX Tube Fitting
R Inlet
 1/2" Rehau Tube Fitting



CM Inlet COMBINATION
 1/2" Compression Fitting
 1/2" Copper Sweat Fitting

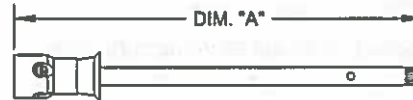
When ordering, specify model, inlet and wall thickness.

WOODFORD



MODEL 14 PARTS LIST

ITEM	PART#	DESCRIPTION
1	30002	Handle Screw
2	30096	Wheel Handle - Round Powder Coated Die Cast Aluminum
2a	50012	Tee Key (Optional)
3	30059	Packing Nut
3a	30512	Packing Nut w/deep stem guard (Optional)
4	30560	EPDM Packing
5	30006	Packing Support Washer
6	35XXX	Valve Stem Assembly (See chart at right) Includes Items 7, 8 & 9
7	30459	Check Valve
8	30008	Valve Seat Rubber
9	30009	Retainer Screw
10	30098	Adjustable Flange
	RK-14MH	Repair Kit (Includes Items 1, 2, 3, 4, 5, 8 & 9)



VALVE STEM ASSEMBLY DIM "A"

Wall Thickness	Overall Length	Part No.
CC (1 3/4)	3 5/8"	35942
4	5 7/8"	35720
6	7 7/8"	35721
8	9 7/8"	35722
10	11 7/8"	35723
12	13 7/8"	35724
14	15 7/8"	35725
16	17 7/8"	35736
18	19 7/8"	35726
20	21 7/8"	35737
22	23 7/8"	35738
24	25 7/8"	35727



For more information contact...

WOODFORD MANUFACTURING COMPANY

2121 Waynoka Road, Colorado Springs, Colorado 80915 • Phone: (800) 621-6032 • Fax: (800) 765-4115

To view our complete product line visit: www.woodfordmfg.com or email: sales@woodfordmfg.com

A Division Of WCM Industries, Inc.

WCO

Location: _____

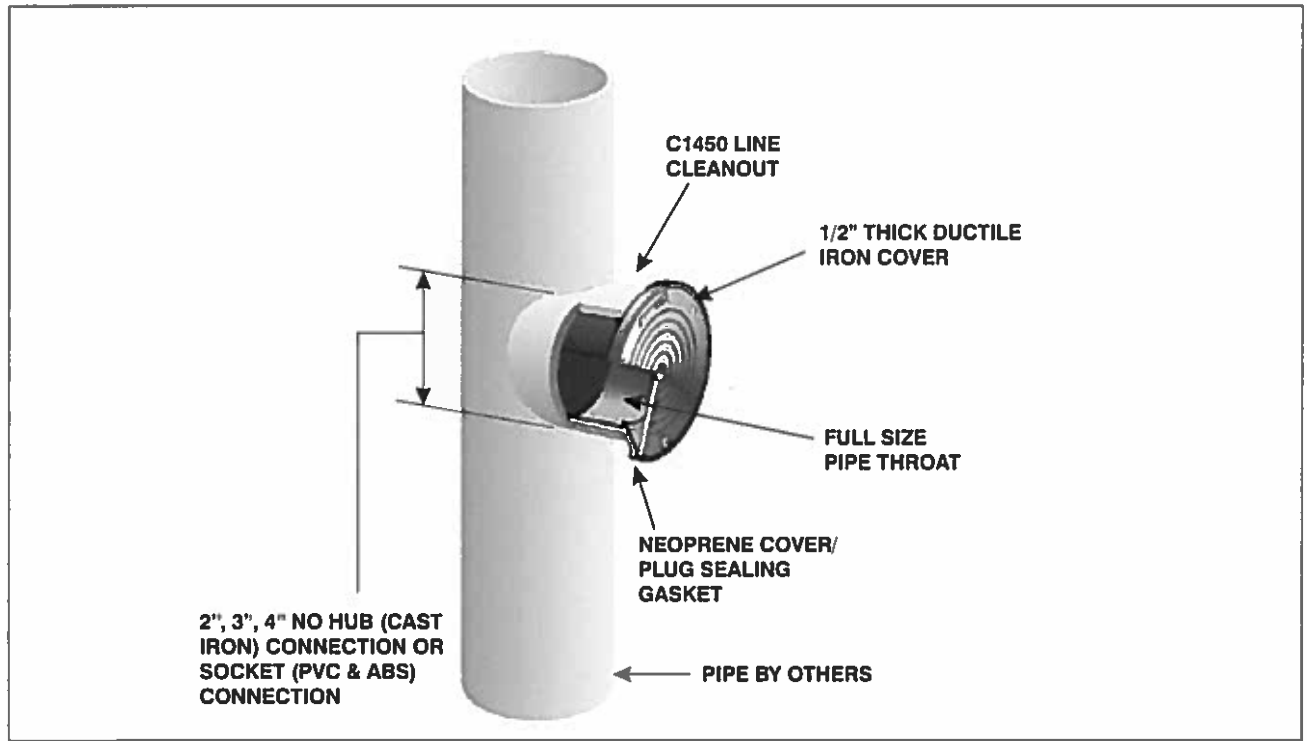


C1450

LINE CLEANOUT

Specification: MIFAB Series C1450 (select model number with body material type) line cleanout plug with blind tapping.

Function: Typically used in drainage pipe where a cleanout is required. Plug will fit into pipe opening and is available in either cast iron, PVC, ABS or nickel bronze material to suit the pipe material. Tapping in plug can receive bolt from cleanout plate.



MODEL NUMBER	PIPE SIZE	COVER DIAMETER
○ C1452	2" (51)	5"
○ C1453	3" (76)	5"
○ C1454	4" (102)	5"

C1450 Series meets ANSI/ASME floor drain standard A112.6.3-2001

- SUFFIX OPTIONAL VARIATIONS:**
- 1 Nickel bronze body and cover
 - 4 Ductile iron cover and cast iron body
 - 6 Security screws (TR25 Torx & pin)
 - 30 PVC socket connection body and ductile iron cover
 - 31 ABS socket connection body and ductile iron cover
 - 95 Client logo
 - ARRA ARRA (Stimulus Act) compliant product
 - BA Buy American Act compliant product
 - PA Pennsylvania Steel Act compliant product

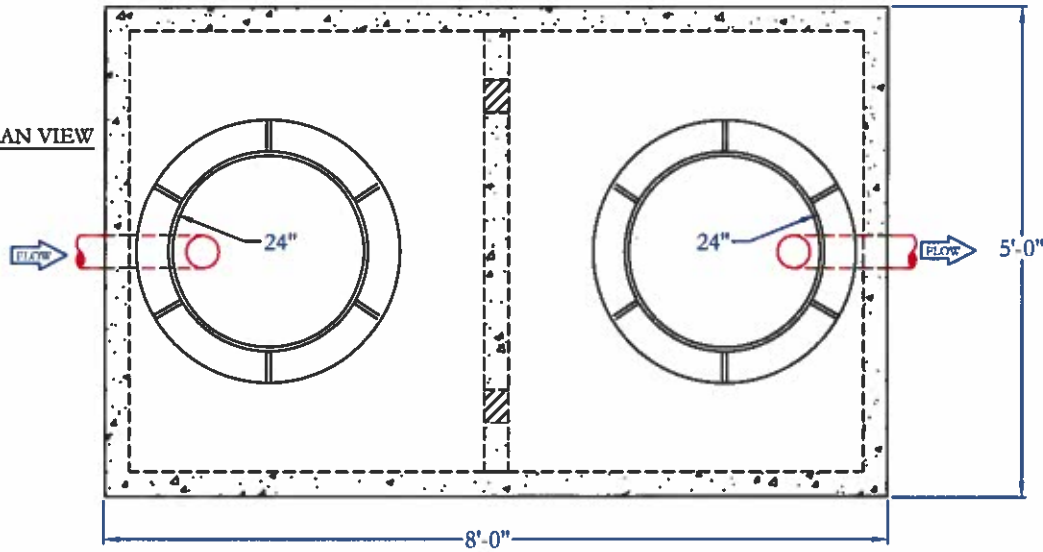
Job Name: _____
 Section No: _____
 Schedule No: _____

Page No: _____
 Contractor: _____
 Purchase Order No: _____

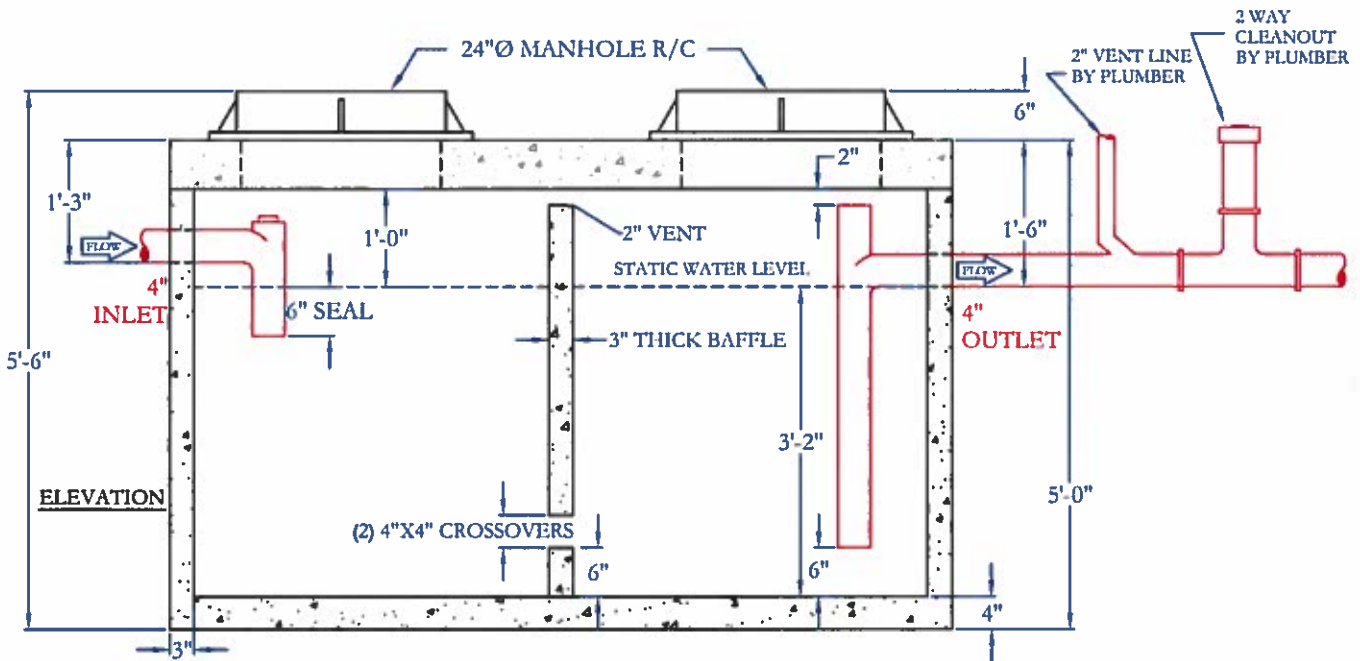
MIFAB reserves the right to make changes in material and design without formal notice and obligation.

150 gallon GT-1 (grease trap)

PLAN VIEW



ELEVATION



SPECIFICATIONS:

- CONCRETE:** Class 1 concrete with design strength of 4500 PSI at 28 days. Unit is of monolithic construction at floor and first stage of wall. Baffle is slide in type.
- REINFORCEMENT:** Grade 60 reinforced with steel rebar conforming to ASTM A-615 on required centers.
- C.I. CASTINGS:** Cast Iron Ring & Cover shall be nominal 24" and traffic duty

ENGINEERING DATA:

Grease Trap is structurally and hydraulically engineered conforming to Louisiana Department of Health & Hospitals Plumbing Code. Nominal liquid capacity as indicated on plan.

Field excavation and preparation shall be completed prior to delivery of grease trap. Use dimensional data as shown.

750 GALLON GREASE TRAP

GCP-750GT (NON-TR)

SCALE: NOT TO SCALE	DATE: 3/17/11 CG
28021 Coker-Vail Road Phone (225) 567 - 2700	Holden, LA 70744 Fax (225) 567 - 3089
www.gaineyconcrete.com	

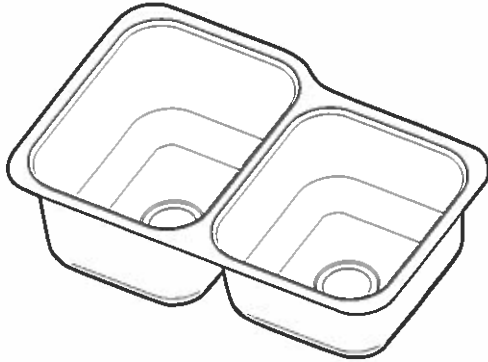


SK-1



Buy it for looks. Buy it for life.®

Specifications



Model Number	Depth-Inches (left bowl, right bowl)	Drain Placement	Model Specified
G18231	10, 8	Center	
G18232	8	Center	

SINK DESCRIPTION

- 1800 Series double bowl undermount sink
- 18 gauge stainless steel, Brushed finish
- Center drain location
- Mounting brackets included, other standard mounting hardware and silicone sealant not included
- SoundSHIELD sound absorbing system

CUT OUT DIMENSIONS

- Template included - template number 22509

STANDARDS

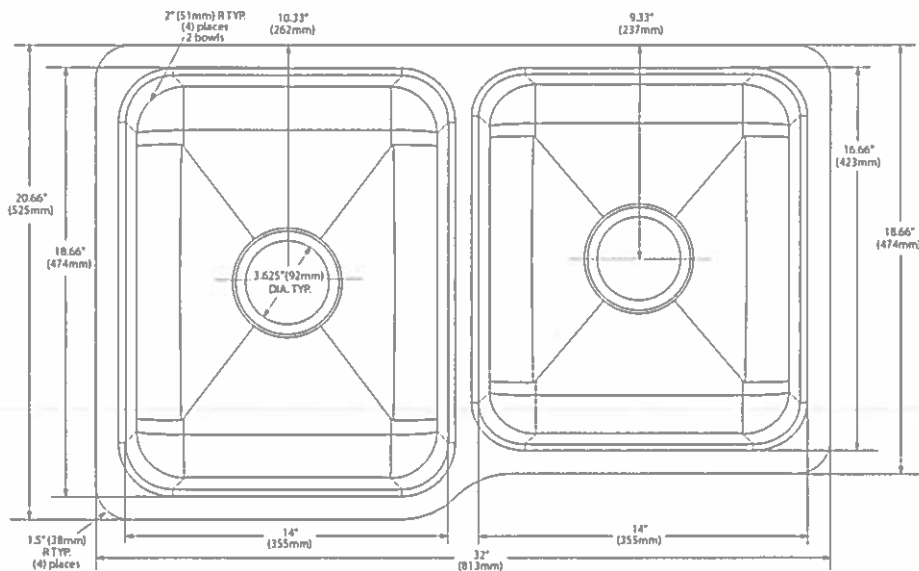
- Third party certified by IAPMO to meet ASME A112.19.3 and all applicable specifications referenced therein

WARRANTY

- Limited lifetime warranty against material or manufacturing defects to the original consumer purchaser

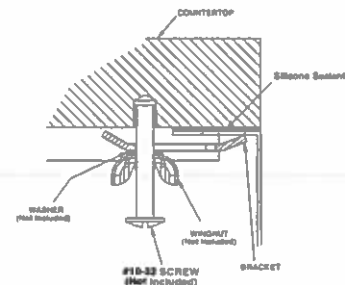
CRITICAL DIMENSIONS

(DO NOT SCALE)



MADE IN THE USA

Installation Detail



SK-1



Buy it for looks. Buy it for life.®

Specifications

DESCRIPTION

- Metal construction with various finishes identified by suffix
- Hydrolock® quick connect installation
- Pullout spray with 68" braided hose
- Flexible supply lines with 3/8" compression fittings connect directly to supply stop
- 360° rotating spout

OPERATION

- Single handle lever
- Operates with less than 5 lbs. of force
- Operates in spray or stream mode in the pullout or retracted position
- When filling a vessel outside the sink, the pause feature conveniently stops the flow of water as the wand passes over the counter top

FLOW

- Flow is limited to 1.5 gpm (5.7 L/min) at 60 psi
- Operates in eco-performance mode by default in aerated and spray stream

CARTRIDGE

- 1255™ Duralast™ cartridge for Single-Handle Faucets

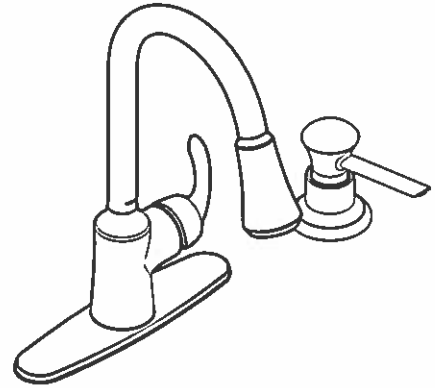
STANDARDS

- Third party certified to IAPMO Green ASME A112.18.1/CSA B-125.1 and all applicable requirements referenced therein including NSF 61/9
- Meets CalGreen and Georgia SB370 requirements
- Contains no more than 0.25% weighted average lead content
- Complies with California Proposition 65 and with the Federal Safe Drinking Water Act
- The backflow protection system in the device consists of two independently operating check valves, a primary and a secondary which prevent backflow

- ADA  for lever handle

WARRANTY

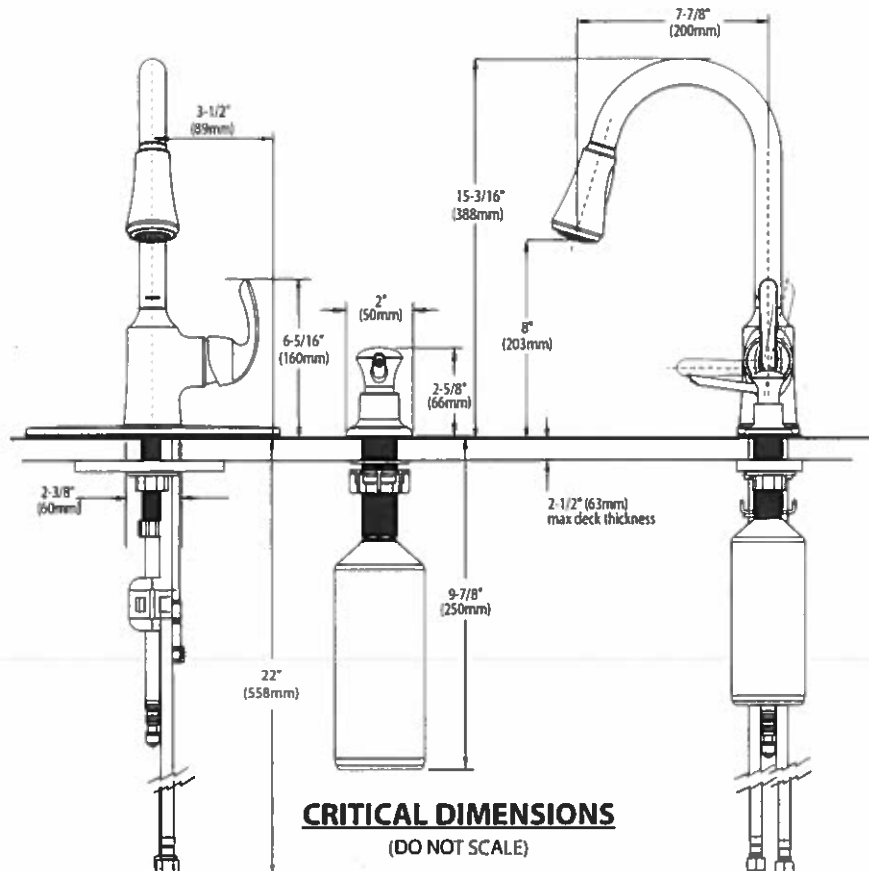
- Lifetime limited warranty against leaks, drips and finish defects to the original consumer purchaser
- 5 year warranty if used in commercial installations



Single Handle High Arc Pulldown Kitchen Faucet

Model: CA87094 series

NOTE: THIS FAUCET IS DESIGNED TO BE INSTALLED THRU 1 HOLE, 1-1/2" (38mm) MIN. DIA.





Buy it for looks. Buy it for life.®

SH-1 & B-1

Specifications

DESCRIPTION

- Metal construction with various finishes identified by suffix
- Pressure balancing cycle valve design with an adjustable temperature limit stop
- 1/2" IPS connections
- Includes valve, tub spout, showerhead, arm and flange

OPERATION

- Lever style handle
- Handle operates counterclockwise through a 270° arc with off at 6 o'clock and maximum hot at the 9 o'clock position. Shut off in clockwise direction
- Adjustable temperature limit stop to control maximum hot water temperature
- Pressure balancing mechanism maintains selected discharge temperature to ± 2°


FLOW

- Showerhead is limited to 2.5 gpm (9.5 L/min)

CARTRIDGE

- 1222 cartridge design
- Nonmetallic/nonferrous and stainless steel materials
- Accommodates back to back installations

STANDARDS

- Third party certified to ASME A112.18.1/CSA B-125.1 and all applicable requirements referenced therein
- ADA  for lever handle

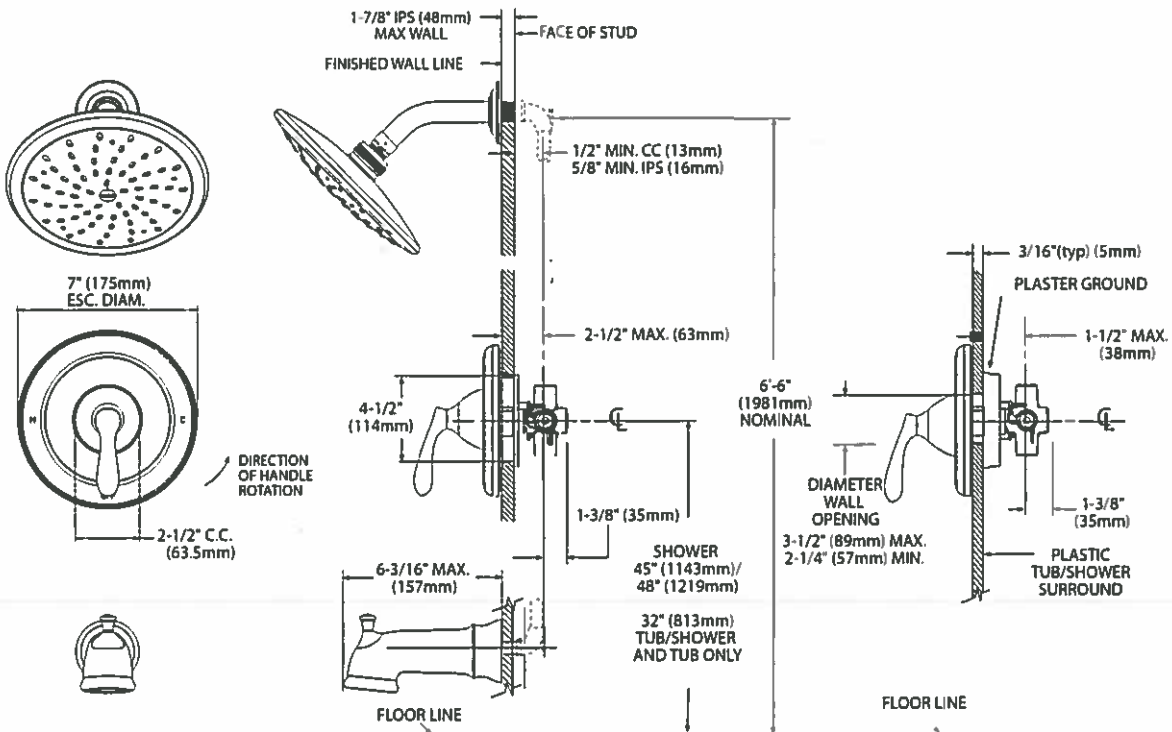
WARRANTY

- Lifetime limited warranty against leaks, drips and finish defects to the original consumer purchaser
- 5 year warranty if used in commercial installations



Single-Handle Tub/Shower Valve

Models: 82991 series





Specifications

DESCRIPTION

- Chrome plated metal construction
- Pressure balancing cycle valve design with 1/4 turn stops
- 3 function transfer valve with 1/2" CC connections
- Contains: hand-held shower with non-positive pause, 69" metal hose, 30" slide bar, drop ell, vacuum breaker and tub filler
- **Slide bar is NOT DESIGNED TO BE A GRAB BAR**
- Applicable components are supplied with vandal resistant screws

OPERATION

- Temperature and transfer valves both have ADA compliant lever style handles
- Temperature handle operates counterclockwise through a 270° arc with off at 6 o'clock, and the maximum hot at the 9 o'clock position
- Adjustable temperature limit stop
- Pressure balancing mechanism maintains selected discharge temperature to ± 2°
- Transfer valve operates 3 distinct functions

FLOW

- 2.5 gpm (9.5L/min) hand-held shower

CARTRIDGE

- 1222HD brass cartridge design in temperature control valve accommodates back to back installations
- Brass construction with stainless steel materials
- Ceramic disc cartridge in transfer valve

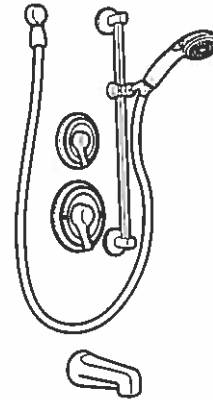
STANDARDS

- Third party certified to ASME A112.18.1/CSA B125.1 and all applicable requirements referenced therein

- ADA for lever handles

WARRANTY

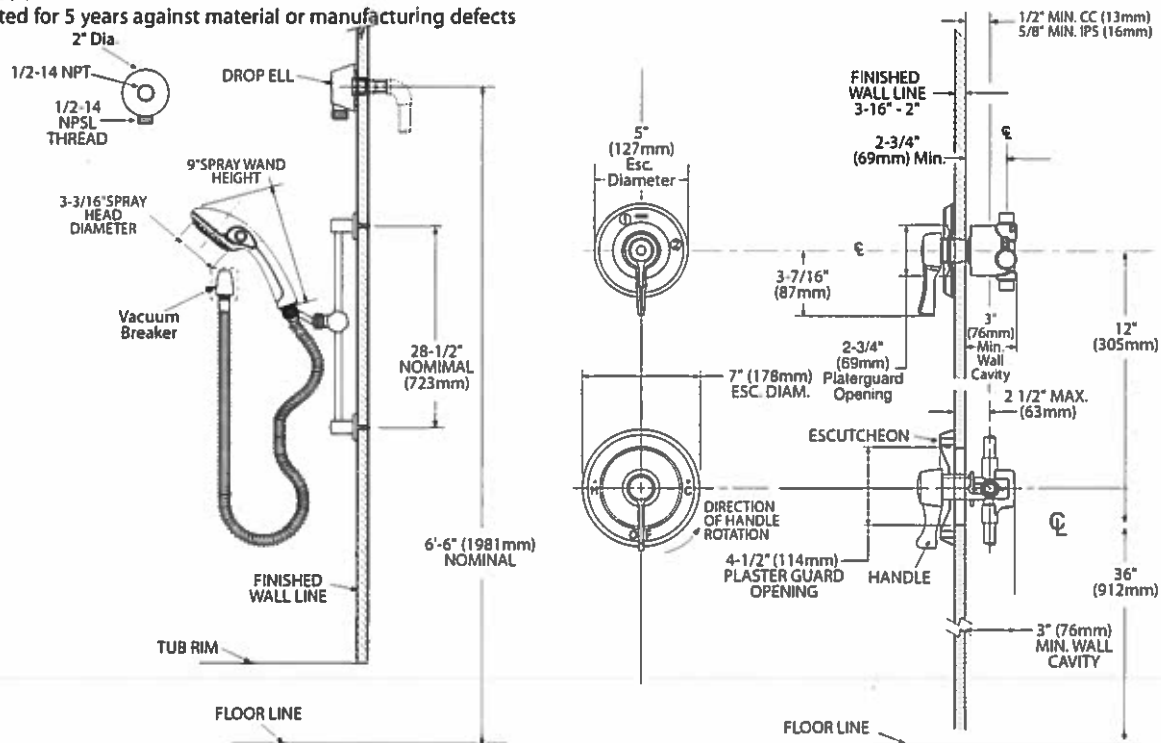
- Warranted for 5 years against material or manufacturing defects



Three-Function Commercial Tub/Shower System



Model: 8341



NOTE: This valve is not intended to be used as a shut-off valve. To prevent the potential of cross flow, check valves must be integral to the supply valve or installed in both hot and cold water supply lines.

CRITICAL DIMENSIONS

(DO NOT SCALE)

