

PROJECT MANUAL FOR

**221 Congress Street**  
**Portland, Maine 04101**

PERMIT SET SUBMISSION

July 20, 2017

ARCHITECT

Caleb Johnson  
Architect + Builders  
110 Exchange Street, Floor 2  
Portland, ME 04101



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## SECTION 011000 - 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. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and drawing conventions.

- B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

#### 1.3 PROJECT INFORMATION

- A. Project Identification: 221 Congress Street.

1. Project Location: 221 Congress Street, Portland, ME 04101.

- B. Owner: Hay Runner, LLC; 221 Congress Street, Portland, ME 04101.

- C. Architect Identification: The Contract Documents were prepared for Project by Caleb Johnson, Architect + Builders, 110 Exchange Street, Portland, Maine 04101. Telephone 207-283-8777.

- D. Construction Manager: Caleb Johnson, Architect + Builders, 110 Exchange Street, Portland, Maine 04101. Telephone 207-283-8777.

1. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

#### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The Work involves the construction of a new mixed use building at location indicated on Drawings. Work includes but is not limited to, site demolition, earthwork, site utilities and site improvements, paving, and landscaping. Work also includes concrete foundations and slab-on-grade, steel structure, engineered wood joists and decking, roof membrane over roof insulation, green roof system, sheet metal flashing, masonry, metal wall panels, metal stud framing system, insulation, gypsum board walls and ceilings, ceramic tile, acoustical ceilings, wood flooring, carpeting, custom cabinets and fixtures, carpentry, glass storefront system, aluminum windows, metal doors, wood doors, metal frames, door hardware, sectional overhead doors, ceramic tiling, wood flooring, resilient flooring, carpet tile, painting, toilet accessories, signage, wire mesh partitions, glass shower doors and panels, postal boxes, residential appliances, window shades, residential cabinets, stone countertops, entrance mats, car parking system, elevator, fire protection and detection systems, security systems, electrical, and heating, ventilating, and air conditioning complete and ready for use.

#### 1.5 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.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  1. Streets and Sidewalks: Keep streets, sidewalks, driveways and entrances serving adjacent premises clear and available to others, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

#### 1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.
  1. Weekend Hours: As approved by Architect and Owner.
  2. Early Morning Hours: As approved by Architect and Owner.
  3. Hours for Utility Shutdowns: As approved by Architect and Owner.
  4. Provide 24 hour notice to Architect when performing work other than normal working hours.
- C. Controlled Substances: Use of tobacco products and other controlled substances within the building is not permitted.

## 1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI's "2012 MasterFormat" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
  2. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- B. 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.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000



SECTION 012100 - 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.
  - 2. Include the cost of allowances in the contract bid price.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
  - 2. Unit-cost allowances.
  - 3. Quantity allowances.
- C. Related Requirements:
  - 1. Section 012200 "Unit Prices" for procedures for using unit prices.
  - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 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 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

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

1.6 COORDINATION

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

1.7 LUMP-SUM AND QUANTITY 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 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 under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 ADJUSTMENT OF ALLOWANCES

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

- 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.
  - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
  - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.
- C. Return unused Lump Sum amounts for credit to Owner in their entirety.

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 \$15,000 for City Improvement Requirements.
- B. Allowance No. 2: Lump-Sum Allowance: Include the sum of \$25,000 for miscellaneous metals associated with Auto Park System.
- C. Allowance No. 3: Lump-Sum Allowance: Include the sum of \$4,000 for interior and exterior signage.
- D. Allowance No. 4: Lump-Sum Allowance: Include the sum of \$30,000 for specialty residential entrance detailing.
- E. Allowance No. 5: Lump-Sum Allowance: Include the sum of \$379,000 for Parkmatic Car Parking System.

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- F. Allowance No. 6: Lump-Sum Allowance: Include the sum of \$2,000 for Engraved Stone Granite Block.
- G. Allowance No. 7: Lump-Sum Allowance: Include the sum of \$10,000 for furnishing plantings.

END OF SECTION 012100



SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Additional Parking Level.
  - 1. Base Bid: Do not provide additional parking level.
  - 2. Alternate: Provide additional parking level.
  
- B. Alternate No. 2A: Galvanized Metal Guardrails at Roof.
  - 1. Base Bid: Provide primed steel and specified paint finish on Metal Guardrails at Roof.
  - 2. Alternate: Provide primed galvanized steel and specified paint finish on Metal Guardrails at Roof.
  
- C. Alternate No. 2B: Colorgalv Finish for Metal Guardrails at Roof.
  - 1. Base Bid: Provide primed steel and specified paint finish on Metal Guardrails at Roof.
  - 2. Alternate: Provide Colorgalv Finish on Metal Guardrails at Roof.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION 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. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for products selected under an allowance.
  - 2. Section 012300 "Alternates" for products selected under an alternate.
  - 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit electronic copy 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. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
  - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven 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 seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Substitution request is fully documented and properly submitted.
    - e. Requested substitution will not adversely affect Contractor's construction schedule.
    - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - g. Requested substitution is compatible with other portions of the Work.
    - h. Requested substitution has been coordinated with other portions of the Work.
    - i. Requested substitution provides specified warranty.
    - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500



SECTION 012600 - 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. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the 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. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within 20 days, when not otherwise specified, 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 bonds, insurance, taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include quotes on supplier's and subcontractor's letterhead for the requested change.

- e. 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 changed conditions require modifications to the Contract, Contractor may initiate a claim 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 bonds, insurance, 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 Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
  - 7. Proposal Request Form: Use form acceptable to Architect.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

#### 1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

#### 1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes 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.



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- 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 012600



SECTION 012900 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
  - 2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 3. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

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. Coordinate 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. Submittal schedule.
    - c. Items required to be indicated as separate activities in Contractor's construction 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.

3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use 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. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  2. Arrange schedule of values consistent with format of AIA Document G703.
  3. 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. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
      - 1) Labor.
      - 2) Materials.
      - 3) Equipment.
  4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
    - a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
  5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  6. 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. If required, include evidence of insurance.
  7. 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.

8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
  9. 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.
  10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.
- C. Draw-Down Schedule: The Contractor shall furnish to the Architect, at the beginning of the project, an expected monthly requisition estimate for the Owner's use in planning funding.

#### 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial 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 Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will 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 for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

- E. **Stored Materials:** Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
  
- F. **Transmittal:** Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One 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.
  
- G. **Waivers of Mechanic's Lien:** With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. The list of subcontractors, principal suppliers and fabricators shall be used to designate which entities involved in the Work must submit waivers. The list shall be approved by the Owner.
  - 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  - 5. **Waiver Forms:** Submit executed waivers of lien on forms, acceptable to Owner.
  
- H. **Record Drawing Updates:** With each Application of Payment, record documents shall be maintained and current for all trades, available for viewing at a central location.
  
- I. **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. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
  5. Products list (preliminary if not final).
  6. Submittal schedule (preliminary if not final).
  7. List of Contractor's staff assignments.
  8. List of Contractor's principal consultants.
  9. Copies of building permits and other required 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.
- J. Progress Applications for Payment: Administrative actions and submittals that must precede or coincide with submittal of progress Applications for Payment include the following:
1. Contractor's Construction Schedule update.
  2. Submittals for Work being requisitioned for are complete and approved.
  3. Submit list of completed tests, checklists, commissioning, reports, and similar requirements for the work are submitted and in compliance with the Contract Documents.
  4. Minutes of previous month's progress meeting have been distributed.
  5. Record drawings and documents are current.
- K. Application for Payment at Substantial Completion: After Architect issues 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 Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- L. Final Payment Application: After completing Project closeout requirements, 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. Final submittal of record documents and operation, maintenance data and demonstration and training.
  3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  4. Updated final statement, accounting for final changes to the Contract Sum.
  5. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner.
  6. Evidence that claims have been settled.
  7. 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.
  8. Final liquidated damages settlement statement, if applicable.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900



SECTION 013100 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

#### 1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different 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 to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical. Coordinate location of pipes, conduits, ducts and similar items in confined areas to assure proper fit and access. Contractor is responsible for handling interferences created by the work of subcontractors (example, sprinkler pipe interfering with installation of duct work; duct work interfering with installation of light fixtures, overhead construction interfering with installation of finish ceilings at proper height).
  - 5. Coordinate the work to provide smoke and fire seals for component interfaces and penetrations of smoke walls and fire rated construction.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.

5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

#### 1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
  - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

- D. Architect's Action: Architect will review each RFI, determine action required, and respond. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. 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 returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's response was received.
- 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.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

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

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of record documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for preparing operations and maintenance data.
    - e. Requirements for delivery of material samples, attic stock, and spare parts.
    - f. Requirements for demonstration and training.
    - g. Preparation of Contractor's punch list.
    - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - i. Submittal procedures.
    - j. Coordination of separate contracts.
    - k. Owner's partial occupancy requirements.
    - l. Installation of Owner's furniture, fixtures, and equipment.
    - m. Responsibility for removing temporary facilities and controls.
  4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. 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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Application for Payment: Contractor shall bring copy of Application for Payment to meeting. Review Application for Payment and required attachments, including record drawing and documents status, waivers of mechanic's liens, list of completed tests, checklists, commissioning, reports, and similar requirements for the work are submitted and in compliance with the Contract Documents.
    - c. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.

- 3) Status of submittals.
  - 4) Deliveries.
  - 5) Off-site fabrication.
  - 6) Access.
  - 7) Site utilization.
  - 8) Temporary facilities and controls.
  - 9) Progress cleaning.
  - 10) Quality and work standards.
  - 11) Status of correction of deficient items.
  - 12) Field observations.
  - 13) Status of RFIs.
  - 14) Status of proposal requests.
  - 15) Pending changes.
  - 16) Status of Change Orders.
  - 17) Pending claims and disputes.
  - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.



- 2) Sequence of operations.
  - 3) Status of submittals.
  - 4) Deliveries.
  - 5) Off-site fabrication.
  - 6) Access.
  - 7) Site utilization.
  - 8) Temporary facilities and controls.
  - 9) Work hours.
  - 10) Hazards and risks.
  - 11) Progress cleaning.
  - 12) Quality and work standards.
  - 13) Change Orders.
3. Conduct coordination meetings with the mechanical, plumbing, sprinkler and electrical trades. Before the trades start work in an area of the building, make field measurements, review structural clearances and locations of ducts, pipes, conduits, light fixtures, equipment and other items that affect location and proper fit. Prepare coordination sketches to maximize utilization of space for efficient installation of different components. Verify depths and clearances before fabrication of ductwork.
  4. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100



SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

- 1. Startup construction schedule.
- 2. Contractor's construction schedule.
- 3. Construction schedule updating reports.
- 4. Daily construction reports.
- 5. Material location reports.
- 6. Site condition reports.
- 7. Special reports.

- B. Related Requirements:

- 1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
- 2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

- 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
- 2. Predecessor Activity: An activity that precedes another activity in the network.
- 3. Successor Activity: An activity that follows another activity in the network.

- B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

- C. Event: The starting or ending point of an activity.

- D. Float: The measure of leeway in starting and completing an activity.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
  - 1. PDF electronic file.
- B. Startup construction schedule.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at weekly intervals.
- F. Material Location Reports: Submit at monthly intervals.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.
- H. Special Reports: Submit at time of unusual event.
- I. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
  - 1. Discuss constraints, including work stages, area separations and milestones.
  - 2. Review submittal requirements and procedures.
  - 3. Review time required for review of submittals and resubmittals.
  - 4. Review requirements for tests and inspections by independent testing and inspecting agencies.
  - 5. Review time required for Project closeout and Owner startup procedures.
  - 6. Review and finalize list of construction activities to be included in schedule.
  - 7. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
3. Allow for time in the construction schedule for materials to dry before they are enclosed to prevent the growth of mold and bacteria

## PART 2 - PRODUCTS

### 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.
  1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
  1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
  4. Startup and Testing Time: Include no fewer than 15 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.
  6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  1. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Partial occupancy before Substantial Completion.
    - e. Use of premises restrictions.
    - f. Provisions for future construction.
    - g. Seasonal variations.
    - h. Environmental control.

2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Mockups.
    - e. Fabrication.
    - f. Sample testing.
    - g. Deliveries.
    - h. Installation.
    - i. Tests and inspections.
    - j. Adjusting.
    - k. Curing.
    - l. Building flush-out.
    - m. Startup and placement into final use and operation.
  3. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    - a. Structural completion.
    - b. Temporary enclosure and space conditioning.
    - c. Permanent space enclosure.
    - d. Completion of mechanical installation.
    - e. Completion of electrical installation.
    - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.
  5. Pending modifications affecting the Work and Contract Time.

## 2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for commencement of the Work.

- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

### 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

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

### 2.4 REPORTS

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

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1. Material stored prior to previous report and remaining in storage.
  2. Material stored prior to previous report and since removed from storage and installed.
  3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

### 2.5 SPECIAL REPORTS

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

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

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

END OF SECTION 013200



SECTION 013300 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1.3 DEFINITIONS

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

#### 1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  2. Submittals shall be scheduled in an orderly fashion that spreads the submissions out over a period of time to permit Architect adequate opportunity to schedule personnel for timely reviews. Where submittals are not required to be submitted concurrently, or do not require coordination with other submittals, Contractor shall review, stamp, and submit as submittals are received. Contractor shall not receive submittals, hold them, and then release them to the Architect all at once.
  3. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
  4. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
  5. Format: Arrange the following information in a tabular format:
    - a. Scheduled date for first submittal.
    - b. Specification Section number and title.
    - c. Submittal category: Action; informational.
    - d. Name of subcontractor.
    - e. Description of the Work covered.
    - f. Scheduled date for Architect's final release or approval.
    - g. Scheduled date of fabrication.
    - h. Scheduled dates for purchasing.
    - i. Scheduled dates for installation.
    - j. Activity or event number.

#### 1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals. Contact Architect for information.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
    - a. Sitework submittals.
    - b. Commercial equipment submittals.
    - c. Structural submittals.
    - d. Mechanical submittals.
    - e. Electrical submittals.
    - f. Data & Communications Systems submittals.
  5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
  6. Submittals with Color Selections: Deliver to Architect a list of submittals required for the exterior color package and a list required for the interior color package. The Architect needs to coordinate the colors of all exterior and interior items and will hold submittals with color selections until all materials in the exterior color package have been received. Allow 2 weeks after the last item has been submitted for return of exterior color selections. The Architect will hold submittals with color selections until all materials in the interior color package have been received. Allow 3 weeks after the last item has been submitted for return of interior color selections. Careful coordination of the Submittal Schedule by the Contractor is required so as not to delay the Work.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.
  - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., ABCD-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., ABCD-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner, containing the following information:
  - a. Project name.
  - b. Date.
  - c. Name and address of Architect.
  - d. Name of Contractor.
  - e. Name of firm or entity that prepared submittal.
  - f. Names of subcontractor, manufacturer, and supplier.
  - g. Category and type of submittal.
  - h. Submittal purpose and description.
  - i. Specification Section number and title.
  - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
  - k. Drawing number and detail references, as appropriate.
  - l. Location(s) where product is to be installed, as appropriate.
  - m. Related physical samples submitted directly.
  - n. Indication of full or partial submittal.
  - o. Transmittal number, numbered consecutively.
  - p. Submittal and transmittal distribution record.
  - q. Other necessary identification.
  - r. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
  - a. Project name.
  - b. Number and title of appropriate Specification Section.
  - c. Manufacturer name.
  - d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable. Mark with dark colored pen that permits photocopying.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.

- e. Testing by recognized testing agency.
  - f. Application of testing agency labels and seals.
  - g. Manufacturer's Safety and Data Sheets (MSDS).
  - h. Notation of coordination requirements.
  - i. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:
    - a. PDF electronic file.
    - b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
  3. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.

- b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.
  3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: 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.
  6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- I. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.



7. Limitations of use.

- S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file or three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
  - 1. The Contractor shall review submittals for completeness and compliance with the Contract Documents. If submittal contains substitutions, Contractor shall process

substitutions in accordance with Section 012500 "Substitution Procedures," and not part of specified Shop Drawings or Product Data submittals. Contractor is responsible for keeping Subcontractors on time with the submittal schedule. If the Contractor submits submittals that are repeatedly rejected, requiring the Architect to perform multiple reviews of the same submittal because of the failure to properly prepare and complete the submittals.

- a. Owner will compensate Architect for such additional services.
  - b. Owner will deduct the amount of such compensation from the final payment of the Contractor.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
1. Stamp or statement shall include the following: "The Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents."

### 3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
1. The Architect's marking of "Approved," "Approved As Noted" or similar verbiage means submittal has been reviewed for general conformance to the Contract Documents only and does not mean unqualified acceptance. The Contractor is fully responsible for compliance with the Contract Documents.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

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- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300



SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
  - 1. Indicate manufacturer and model number of individual components.
  - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.
  - 4. Identification of applicable standards.
  - 5. Identification of test and inspection methods.
  - 6. Number of tests and inspections required.
  - 7. Time schedule or time span for tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award or Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
  - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

#### 1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, and telephone number of technical representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Statement that products at Project site comply with requirements.



4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

#### 1.9 QUALITY ASSURANCE

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

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, and mockups, and laboratory mockups; do not reuse products on Project.
  2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
  4. Demonstrate the proposed range of aesthetic effects and workmanship.
  5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  7. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

#### 1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
  3. 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: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect 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. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.

- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
  - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.11 SPECIAL TESTS AND INSPECTIONS

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

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

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

END OF SECTION 014000

Project: 221 Congress Street  
Date Prepared: 7/21/17

## Structural Statement of Special Inspections

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Project: 221 Congress Street

Location: 221 Congress St, Portland, ME

Owner: Hay Runner, LLC

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This *Statement of Special Inspections* encompass the following discipline: **Structural**

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Structural Special Inspection Coordinator (SSIC) and the identity of other approved agencies to be retained for conducting these inspections and tests.

The Structural Special Inspection Coordinator shall keep records of all Structural inspections and shall furnish inspection reports to the Building Code Official (BCO) and the Structural Registered Design Professional in Responsible Charge (SRDP). Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Structural Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Structural Registered Design Professional in Responsible Charge at an interval determined by the SSIC and the BCO.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted to the BCO prior to issuance of a Certificate of Use and Occupancy.

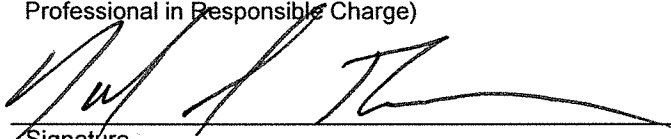
Job site safety and means and methods of construction are solely the responsibility of the Contractor.

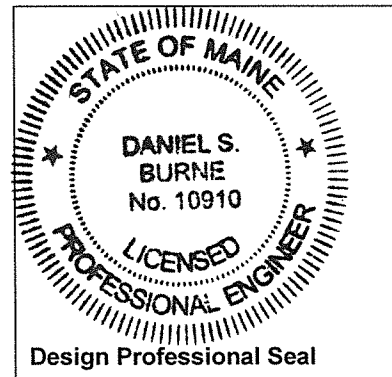
Interim Report Frequency:  Upon request of Building Official \_\_\_\_\_ or  per attached schedule.

Prepared by:

Daniel S. Burne, P.E. - BeckerStructural Engineers.

\_\_\_\_\_  
(type or print name of the Structural Registered Design Professional in Responsible Charge)

 \_\_\_\_\_  
Signature Date 7/21/17



Owner's Authorization:

Building Code Official's Acceptance:

\_\_\_\_\_  
Signature Date

\_\_\_\_\_  
Signature Date

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**Project: 221 Congress Street**  
**Date Prepared: 7/21/17**

## Structural Statement of Special Inspections (Continued)

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### List of Agents

Project: 221 Congress Street

Location: 221 Congress St, Portland, ME

Owner: Hay Runner, LLC

This Statement of Special Inspections encompass the following discipline: **Structural**

(Note: Statement of Special Inspections for other disciplines may be included under a separate cover)

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- Soils and Foundations
- Cast-in-Place Concrete
- Precast Concrete System
- Structural Masonry Systems
- Structural Steel
- Wood Construction
- Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. STRUCTURAL Special Inspections Coordinator (SSIC)	T.B.D.	
2. Special Inspector (SI 1)	T.B.D.	
3. Special Inspector (SI 2)	T.B.D.	
4. Testing Agency (TA 1)	T.B.D.	
5. Testing Agency (TA 2)		
6. Other (O1)		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.



**Project: 221 Congress Street**  
**Date Prepared: 7/21/17**

## Structural Statement of Special Inspections (Continued)

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### Final Report of Special Inspections (SSIC/SI 1)

[To be completed by the Structural Special Inspections Coordinator (SSIC/SI 1). Note that all Agent's Final Reports must be received prior to issuance.]

Project: *221 Congress Street*

Location: *221 Congress St, Portland, ME*

Owner: *Hay Runner, LLC*

Owner's Address: *110 Exchange St  
Portland, ME 04101*

Architect of Record: *Caleb Johnson, AIA* *Caleb Johnson Studio*  
*(name)* *(firm)*

Structural Registered Design

Professional in Responsible Charge: *Daniel S. Burne, P.E.* *Becker Structural Engineers*  
*(name)* *(firm)*

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved.

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,  
Structural Special Inspection Coordinator

\_\_\_\_\_  
(Type or print name)

\_\_\_\_\_  
(Firm Name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

***Licensed Professional Seal***

**Project: 221 Congress Street**  
**Date Prepared: 7/21/17**

## Structural Statement of Special Inspections (Continued)

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### Special Inspector's/Agent's Final Report

Project: *221 Congress Street*

Special Inspector or  
Agent:

*(name)*

*(firm)*

Designation: **SI 2**

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Inspector/Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved.

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,  
Special Inspector or Agent:

\_\_\_\_\_  
(Type or print name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

***Licensed Professional Seal or  
Certification Number***

**Project: 221 Congress Street**  
**Date Prepared: 7/21/17**

## Structural Statement of Special Inspections (Continued)

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### Special Inspector's/Agent's Final Report

Project: *221 Congress Street*

Special Inspector or  
Agent:

*(name)*

*(firm)*

Designation: **TA-1**

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Inspector/Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved.

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,  
Special Inspector or Agent:

\_\_\_\_\_  
(Type or print name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

SEAL NOT REQUIRED FOR  
TESTING AGENCY.

***Licensed Professional Seal or  
Certification Number***

## Structural Schedule of Special Inspections

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### Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided to the Special Inspector for their records. *NOTE VERIFICATION THAT QUALIFIED INDIVIDUALS ARE AVAILABLE TO PERFORM STIPULATED TESTING AND/OR INSPECTION SHOULD BE PROVIDED PRIOR TO SUBMITTING STATEMENT. AGENT QUALIFICATIONS IN SCHEDULE ARE SUGGESTIONS ONLY; FINAL QUALIFICATIONS ARE SUBJECT TO THE DISCRETION OF THE REGISTERED DESIGN PROFESSIONAL PREPARING THE SCHEDULE.*

#### Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge or Special Inspector of Record deems it appropriate that the individual performing a stipulated test or inspection have a specific certification, license or experience as indicated below, such requirement shall be listed below and shall be clearly identified within the schedule under the Agent Qualification Designation.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

#### Experienced Testing Technician

ETT	Experienced Testing Technician – An Experienced Testing Technician with a minimum 5 years experience with the stipulated test or inspection
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#### American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

#### American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

#### American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.
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#### International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

#### National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

#### Other

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## Structural Schedule of Special Inspections

### SOILS & FOUNDATION CONSTRUCTION

VERIFICATION AND INSPECTION	REQD Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	COMMENTS	AGENT	AGENT QUALIFICATION	TASK COMPLETED
<b>IBC Section 1704.7, 1704.8, 1704.9</b>						
1. Required Verification and Inspection of Soils:						
a. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Y	P	IBC 1704.7	SI2	PE/GE, EIT or ETT	
b. Verify excavations are extended to proper depth and have reached proper material.	Y	P	IBC 1704.7	SI2	PE/GE, EIT or ETT	
c. Perform classification and testing of compacted fill materials.	Y	P	IBC 1704.7	TA1	PE/GE, EIT or ETT	
d. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	Y	C	IBC 1704.7	TA1	PE/GE, EIT or ETT	
e. Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly.	Y	P	IBC 1704.7	SI2	PE/GE, EIT or ETT	
2. Required Verification and Inspection of Driven Deep Foundation Elements:						
a. Verify element materials, sizes and lengths comply with the requirements.	N	C	IBC 1704.8	TA1	PE/GE, EIT or ETT	
b. Determine capacities of test elements and conduct additional load tests, as required.	N	C	IBC 1704.8	SI2	PE/GE, EIT or ETT	
c. Observe driving operations and maintain complete and accurate records for each element.	N	C	IBC 1704.8	TA1	PE/GE, EIT or ETT	
d. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element.	N	C	IBC 1704.8	TA1	PE/GE, EIT or ETT	
3. Required Verification and Inspection of Cast-in-Place Deep Foundation Elements:						
a. Observe drilling operations and maintain complete and accurate records for each element.	N	C	IBC 1704.9	TA1	PE/GE, EIT or ETT	
b. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end bearing strata capacity. Record concrete or grout volumes.	N	C	IBC 1704.9	TA1	PE/GE, EIT or ETT	

See Concrete, Masonry, and/or Steel Schedules for additional material inspections for deep foundation elements as applicable.

## Structural Schedule of Special Inspections

### CONCRETE CONSTRUCTION

VERIFICATION AND INSPECTION	REQD	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	COMMENTS	AGENT	AGENT QUALIFICATION	TASK COMPLETED
	Y/N					
<b>IBC Section 1704.4</b>						
1. Inspection of reinforcing steel, including prestressing tendons, and placement	Y	P	ACI 318: 3.5, 7.1-7.7	SII	PE/SE or EIT	
2. Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5B	N	-	Not applicable. Welding of Reinf Not Allowed	-	-	
3. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased or where strength design is used.	N	C	IBC 1911.5	SII	PE/SE or EIT	
4. Inspection of anchors installed in hardened concrete.	Y	P	IBC 1212.1	SII	PE/SE or EIT	
5. Verifying use of required design mix	Y	P	ACI 318: Ch 4, 5.2-5.4	TA1	ACI-CFTT or ACI-STT	
6. At time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests and determine the temperature of the concrete.	Y	C	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	TA1	ACI-CFTT or ACI-STT	
7. Inspection of concrete and shotcrete placement for proper application techniques	Y	C	ACI 318: 5.9, 5.10	TA1	ACI-CFTT or ACI-STT	
8. Inspection for maintenance of specified curing temperature and techniques	Y	P	ACI 318: 5.11-5.13	SII	PE/SE or EIT	
9. Inspection of Prestressed Concrete						
a. Application of prestressing force.	N	C	ACI 318: 18.20	TA2	PE/SE or EIT	
b. Grouting of bonded prestressing tendons in seismic force resisting system	N	C	ACI 318: 18.18.4	TA1	ACI-CFTT or ACI-STT	
10. Erection of precast concrete members.	N	P	ACI 318: Ch 16	SII	PE/SE or EIT	
11. Verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	N	P	ACI 318: 6.2	TA1	ACI-CFTT or ACI-STT	
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.	Y	P	Limitations apply. See below	SII	PE/SE or EIT	

Limitations of item 12: Special inspection includes periodic review of formwork shape, general location, and formwork dimensions that can be readily measured with conventional tape measure. Verification of building layout, building location, foundation extents, column grids, and foundation elevations is excluded.

**Structural Schedule of Special Inspections**  
**MASONRY CONSTRUCTION – LEVEL 1**

VERIFICATION AND INSPECTION  IBC Section 1704.5	REQD	EXTENT:	COMMENTS	AGENT	AGENT QUALIFICATION	TASK COMPLETED
	Y/N	CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE				
1. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	Y	P	ACI530.1, 1.5	SII	PE/SE or EIT	
2. Verification of $F_m$ and $F_{AAC}$ prior to construction except where specifically exempted by this code.	Y	P	ACI531.1, 1.4B	TA1	ACI-CFTT or ACI-STT	
3. Verification of slump flow and VSI as delivered to the site for self-consolidating grout.	Y	C	ACI530.1, 1.5B.1.b.3	TA1	ACI-CFTT or ACI-STT	
4. As masonry construction begins, the following shall be verified to ensure compliance:						
a. Proportions of site-prepared mortar.	Y	P	ACI530.1, 2.6A	TA1	ACI-CFTT or ACI-STT	
b. Construction of mortar joints.	Y	P	ACI530.1, 3.3B	TA1	ACI-CFTT or ACI-STT	
c. Location of reinforcement and connectors.	Y	P	ACI530.1, 3.4, 3.6A	SII	PE/SE or EIT	
d. Prestressing technique.	N	P	ACI530.1, 3.6B	SII	PE/SE or EIT	
e. Grade and size of prestressing tendons and anchorages.	N	P	ACI530.1, 2.4B, 2.4H	SII	PE/SE or EIT	
5. During construction the inspection program shall verify:						
a. Size and location of structural elements.	Y	P	ACI530.1, 3.3F	SII	PE/SE or EIT	
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	Y	P	ACI530, 1.2.2(e), 2.1.4, 3.1.6	SII	PE/SE or EIT	
c. Specified size, grade and type of reinforcement, anchor bolts, prestressing tendons and anchorages.	Y	P	ACI530, 1.12, ACI530.1, 2.4, 3.4	SII	PE/SE or EIT	
d. Welding of reinforcing bars.	N	-	Not applicable. Welding of Reinf Not Allowed	-	-	
e. Preparation, construction and protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	Y	P	IBC 2104.3, 2104.4; ACI530.1, 1.8C, 1.8D	SII	PE/SE or EIT	
f. Application and measurement of prestressing force.	N	C	ACI530.1, 3.6B	TA2	PE/SE or EIT	
6. Prior to grouting, the following shall be verified to ensure compliance:						
a. Grout space is clean.	Y	P	ACI530.1, 3.2D	SII	PE/SE or EIT	
b. Placement of reinforcement and connectors and prestressing tendons and anchorages.	N	P	ACI530, 1.12, ACI530.1, 3.4	SII	PE/SE or EIT	
c. Proportions of site-prepared grout and prestressing grout for bonded tendons.	N	P	ACI530.1, 2.6B	TA1	ACI-CFTT or ACI-STT	
d. Construction of mortar joints.	Y	P	ACI530.1, 3.3B	TA1	ACI-CFTT or ACI-STT	
7. Grout placement shall be verified to ensure compliance.	Y	C	ACI530.1, 3.5	TA1	ACI-CFTT or ACI-STT	
a. Grouting of prestressing bonded tendons.	N	C	ACI530.1, 3.6C	TA1	ACI-CFTT or ACI-STT	
8. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	Y	C	IBC 2105.2.2, 2105.3; ACI530.1, 1.4	TA1	ACI-CFTT or ACI-STT	

**Structural Schedule of Special Inspections - STEEL CONSTRUCTION**

VERIFICATION AND INSPECTION	REQD Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	COMMENTS	AGENT	AGENT QUALIFICATION	TASK COMPLETED
<b>IBC Section 1704.3</b>						
1. Material verification of high-strength bolts, nuts and washers:						
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	Y	P	Applicable ASTM material standards, AISC 360, A3.3	TA1	AWS/AISC-SSI	
b. Manufacturer's certificate of compliance required.	Y	S		SII	PE/SE or EIT	
2. Inspection of high-strength bolting						
a. Snug-tight joints.	Y	P		TA1	AWS/AISC-SSI	
b. Pretensioned and slip-critical joints using turn-of-nut with matchmaking, twist-off bolt or direct tension indicator methods of installation.	Y	P	AISC LRFD Section M2.5	TA1	AWS/AISC-SSI	
c. Pretensioned and slip-critical joints using turn-of-nut without matchmaking or calibrated wrench methods of installation.	Y	C	IBC Sect 1704.3.3	TA1	AWS/AISC-SSI	
3. Material verification of structural steel and cold-formed steel deck:						
a. For structural steel, identification markings to conform to AISC 360.	Y	P	AISC 360, M5.5	SII	PE/SE or EIT	
b. For other steel, identification markings to conform to ASTM standards specified in the approved construction documents.	Y	P	Applicable ASTM material standards	SII	PE/SE or EIT	
c. Manufacturer's certified test reports.	Y	S		SII	PE/SE or EIT	
4. Material verification of weld filler materials:						
a. Identification markings to conform to AWS specification in the approved construction documents.	Y	P	AISC 360, M5.5	TA1	AWS/AISC-SSI	
b. Manufacturer's certificate of compliance required.	Y	S		SII	PE/SE or EIT	
5. Submit current AWS D1.1 welder certificate for all field welders who will be welding on this project.	Y	S	AWS D1.1	SII	PE/SE or EIT	
6. Inspection of welding (IBC 1704.3.1):						
a. Structural steel and cold-formed deck:						
1) Complete and partial joint penetration groove welds.	Y	C	AWS D1.1	TA1	AWS-CWI	
2) Multipass fillet welds.	Y	C		TA1	AWS-CWI	
3) Single-pass fillet welds > 5/16"	Y	C		TA1	AWS-CWI	
4) Plug and slot welds	Y	C		TA1	AWS-CWI	
5) Single-pass fillet welds ≤ 5/16"	Y	P		TA1	AWS-CWI	
6) Floor and deck welds.	Y	P	AWS D1.3	TA1	AWS-CWI	
b. Reinforcing steel:						
1) Verification of weldability of reinforcing steel other than ASTM A706.	N	-	Not applicable.	-	-	
2) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special structural walls of concrete and shear reinforcement.	N	C	AWS D1.4 ACI 318: 3.5.2	TA1	AWS-CWI	
3) Shear reinforcement.	N	C		TA1	AWS-CWI	
4) Other reinforcing steel.	N	P		TA1	AWS-CWI	
7. Inspection of steel frame joint details for compliance (IBC Sect 1704.3.2) with approved construction documents:						
a. Details such as bracing and stiffening.	Y	P	IBC 1704.3.2	SII	PE/SE or EIT	
b. Member locations.	Y	P		SII	PE/SE or EIT	
c. Application of joint details at each connection.	Y	P		SII	PE/SE or EIT	



**Structural Schedule of Special Inspection Services**  
**FABRICATION AND IMPLEMENTATION PROCEDURES – STRUCTURAL STEEL**

VERIFICATION AND INSPECTION  IBC Section 1704.2	REQD	EXTENT:	COMMENTS	AGENT	AGENT QUALIFICATION	TASK COMPLETED
	Y/N	CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE				
1. Fabrications Procedures: Review of fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved special inspection agency. At the completion of fabrication, the approved fabricator shall submit a certificate of compliance to the building code official stating that the work was performed in accordance with the approved construction documents. -OR- 2. AISC Certification	Y	S	Fabricator shall submit one of the two qualifications	SII	PE/SE or EIT	
3. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the building code official stating that the work was performed in accordance with the approved construction documents.	Y	S	IBC 1704.2.2	SII	PE/SE or EIT	

**Structural Schedule of Special Inspections**  
**WOOD CONSTRUCTION**

VERIFICATION AND INSPECTION  IBC Section 1704.6	REQD Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	COMMENTS	AGENT	AGENT QUALIFICATION	TASK COMPLETED
1. Fabrication of high-load diaphragms						
a. Verify wood structural panel sheathing for grade and thickness	Y	P	IBC 1704.6	SII	PE/SE or EIT	
b. Verify the nominal size of framing members at adjoining panel edges	Y	P	IBC 1704.6	SII	PE/SE or EIT	
b. Verify the nail or staple diameter and length	Y	P	IBC 1704.6	SII	PE/SE or EIT	
b. Verify the number of fastener lines	Y	P	IBC 1704.6	SII	PE/SE or EIT	
b. Verify the spacing between fasteners in each line and at edge margins	Y	P	IBC 1704.6	SII	PE/SE or EIT	
2. Load Tests for Joist Hangers: Provide evidence of manufacturer's load test in accordance with ASTM D1761 including the vertical load bearing capacity, torsional moment capacity, and deflection characteristics when there is no calculated procedure recognized by the code.	N	S	IBC 1716 [submit ICBO reports]	SII	PE/SE or EIT	
3. Metal-plate-connected wood trusses spanning 60 feet or greater:						
a. Verify the temporary installation restraint / bracing and the permanent individual truss member restraint / bracing is installed per the approved truss submittal package.	N	P	IBC 1704.6.2.	SII	PE/SE or EIT	

**Structural Schedule of Special Inspections**  
**SEISMIC RESISTANCE - STRUCTURAL**

VERIFICATION AND INSPECTION	REQD Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	COMMENTS	AGENT	AGENT QUALIFICATION	TASK COMPLETE D
<b>IBC Section 1707</b>						
1. Special inspections for seismic resistance. Special inspection as specified in this section is required for the following:						
a. The seismic-force-resisting systems in structures assigned to Seismic Design Category C, D, E or F	N	P	IBC 1707.1	SII	PE/SE or EIT	
b. Designated seismic systems in structures assigned to Seismic Design Category D, E, or F.	N	P	IBC 1707.1	SII	PE/SE or EIT	
2. Structural steel: Continuous special inspection for structural welding in accordance with AISC 341.	N	C	IBC 1707.2	TA1	AWS-CWI	
3. Structural wood:						
a. Continuous special inspection during field gluing operations of elements of the seismic-force-resisting system.	N	C	IBC 1707.3	SII	PE/SE or EIT	
b. Periodic special inspections for nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system (where spacing is 4" o.c., or less) including drag struts, braces and hold-downs	Y	P	IBC 1707.3	SII	PE/SE or EIT	
4. Cold-formed steel framing: Periodic special inspections during welding operations of elements of the seismic-force-resisting system. Periodic special inspections for screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system (where spacing is 4" o.c., or less), including struts, braces, and hold-downs	N	-	CFSF for this project not part of the primary seismic-force resisting system.	-	-	
5. Seismic isolation system. Provide periodic special inspection during the fabrication and installation of isolator units and energy dissipation devices if used as part of the seismic isolation system	N	-	Seismic isolators not used.	-	-	

**SEISMIC RESISTANCE CHECK LIST [IBC 1705.3]**

**Seismic Design Category B**

<input type="checkbox"/> <b>FOR SEISMIC DESIGN CATEGORY C OR HIGHER:</b>	
<b>Structural:</b>	
<input type="checkbox"/> The seismic-force-resisting systems	
<input type="checkbox"/> Steel Braced Frames and associated connections/anchorage (Not required for SDC C, R=3) <input type="checkbox"/> Steel Moment Frames and associated connections (Not required for SDC C, R=3) <input type="checkbox"/> Shear walls: <input type="checkbox"/> CMU <input type="checkbox"/> Wood <input type="checkbox"/> Concrete <input type="checkbox"/> Diaphragms: <input type="checkbox"/> Floor <input type="checkbox"/> Roof <input type="checkbox"/> Other:	

**WIND RESISTANCE CHECK LIST [IBC 1705.4]**

**Wind Exposure Category C**

REQUIRED	NOT REQUIRED	NOT APPLICABLE	WIND RESISTANCE REQUIREMENTS
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	In wind exposure Category B, where the 3-second-gust basic wind speed is 120 miles per hour (mph) (52.8 m/sec) or greater.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	In wind exposure Categories C and D, where the 3-second-gust basic wind speed is 110 mph (49 m/sec) or greater.

Project: 221 Congress Street  
Date Prepared: 7/21/17

# Fabricator's Certificate of Compliance

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Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: **221 Congress Street**

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

**Structural Steel as shown in Contract Documents.**

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual

**Project: 221 Congress Street**  
**Date Prepared: 7/21/17**

**End of Structural Statement of Special Inspections**

SECTION 014200 - REFERENCES

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 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- J. Substantial Completion: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. Minor corrections and repairs that can be performed while the Owner has occupied the building and without undue annoyance to personnel will be acceptable under the definition of Substantial Completion. It shall also include major final cleaning required under the Contract, removal of all surplus equipment and material not required for completion or remaining work, and the placement of remaining materials and equipment in convenient locations as approved by the Owner.

### 1.3 INDUSTRY STANDARDS

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

### 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
  - 1. DIN - Deutsches Institut fur Normung e.V.; [www.din.de](http://www.din.de).
  - 2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
  - 3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
  - 4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).
- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
  - 1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
  - 2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
  - 3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
  - 4. DOD - Department of Defense; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  - 5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
  - 6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
  - 7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
  - 8. FG - Federal Government Publications; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  - 9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  - 10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).



11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; [www.eetd.lbl.gov](http://www.eetd.lbl.gov).
12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
13. SD - Department of State; [www.state.gov](http://www.state.gov).
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org](http://www.trb.org).
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
18. USP - U.S. Pharmacopeial Convention; [www.usp.org](http://www.usp.org).
19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
  - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org/ccb](http://www.wbdg.org/ccb).
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. MDEP - State of Maine Department of Environmental Protection.
2. MDOT - State of Maine Department of Transportation

221 CONGRESS STREET

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014339 - INTEGRATED EXTERIOR MOCKUPS

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 includes administrative and procedural requirements for constructing the Integrated Exterior Mockups.

- 1. Related Sections that will comprise required components within the Integrated Exterior Mockup include the following:

- a. Division 03 Section "Cast-In-Place Concrete" for formed concrete wall system.
- b. Division 04 Section "Unit Masonry" for cavity insulation, masonry veneer materials and systems.
- c. Division 05 Section "Cold-Formed Metal Framing" for wall framing.
- d. Division 05 Section "Metal Fabrications" for masonry shelf angles.
- e. Division 06 Section "Rough Carpentry" for wood framing and blocking at windows.
- f. Division 06 Section "Sheathing" for exterior wall sheathing and floor sheathing.
- g. Division 07 Section "Thermal Insulation" for insulation systems.
- h. Division 07 Section "Metal Wall Panels" for metal siding systems.
- i. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.
- j. Division 09 Section "Gypsum Board" for interior gypsum board.
- k. Division 09 Section "Interior Painting" for painting gypsum board.

- B. Related Sections include the following:

- 1. Division 01 Section "Quality Requirements" for administrative and procedural requirements for quality assurance and quality control.

1.3 DEFINITIONS

- A. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.
- B. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- C. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.4 QUALITY ASSURANCE

- A. Integrated Exterior Mockups: Before installing portions of the Work requiring mockups, construct integrated exterior mockup as indicated on Drawing attached to this section. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials, 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. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
  5. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged. 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.
  6. Demolish and remove mockups when directed, unless otherwise indicated.

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## PART 2 - PRODUCTS

2.1 Refer to individual specification sections for products and materials required for mockup.

## PART 3 - EXECUTION

### 3.1 MOCKUP REVIEW

- A. Notify Architect seven days in advance of dates and times when mockups will be constructed and ready for review.
  - 1. Notify Architect when backup wall system, air barrier system and window has been installed and ready for review.
    - a. Allow seven days for initial review and each re-review of each mockup.
  - 2. Notify Architect when masonry veneer and siding systems has been installed and ready for review.
    - a. Allow seven days for initial review and each re-review of each mockup.

### 3.2 PROTECTION

- A. Protect mockup assemblies for quality-control service activities.
- B. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

END OF SECTION 014000



SECTION 015000 - 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.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
  - 2. Section 312319 "Dewatering" for disposal of ground water at Project site.

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, 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.
- E. Heating Fuel: Fuel required for temporary heating will be the responsibility of the Contractor.
- F. Telephone Service: Pay installation, service and use charges for telephone usage, by Contractor, at Project site.
- G. Internet Service: Pay installation, service and use charges for internet usage, by Contractor, at Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- 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. 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.
- D. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements to protect install concrete and masonry.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.6 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.
- B. Frost Protection: Protect footings and slabs from freezing temperatures and prevent frost from occurring beneath footings and slabs. Frozen water found on soil or concrete surface shall be reason for rejection of protection method. Provide corrective measures within 24 hours after notice of condition is given. Evidence of frost at these locations shall be reason for rejection, removal, and replacement at no additional cost to the Owner.
- C. Use of new heating or cooling systems, during the construction period, will not be allowed unless authorized in writing by the Owner. **If use is allowed by Owner**, the following conditions will apply:



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1. Warranty for all equipment shall commence at date of Substantial Completion and not the start of temporary use.
2. Fuel and electrical for use of the equipment will be paid for by the Contractor.
3. At Substantial Completion, repair, renovate, and clean heating or cooling systems used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete or galvanized steel bases for supporting posts.
  1. Privacy Screen: Provide heavy-duty fabric screen designed for chain link fencing. Provide 5'-9" wide for 6 foot high fencing.
- B. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry."
- C. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.
- D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- E. 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.
- B. **Common-Use Field Office**: Of sufficient size to accommodate needs of 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. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
  3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  4. Lighting fixtures capable of maintaining average illumination of 20 fc 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. Heaters shall be located outside the building and combustion gases shall be vented outside the building. Maintain observation of units in operation.
  - 1. Use of gasoline-burning space heaters, interior 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.
  - 3. Permanent HVAC System: **If Owner authorizes use of permanent HVAC system** for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction or clean HVAC system as required in Section 017700 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## 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.
  - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- 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. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. 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.
- E. 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.
- F. Temporary Heating: Provide temporary heating 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.
  - 1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.
    - a. Refer to Divisions 02 through 48 for additional temporary heat, ventilation, and humidity requirements for products in those Sections.”
  - 2. Provide temporary heat to protect all concrete and masonry work during installation as well as other trades needing specific heat requirements to perform and protect their work. See individual specification sections for detailed information.
  - 3. All concrete slabs on grade, footings and foundations not below the frost line shall be protected from freezing either by heating or protecting with insulation until substantial completion.
- G. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- H. 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.
  - 2. It shall be the General Contractor's responsibility to provide dehumidifiers or humidifiers required to perform the installation of wood floors.
  - 3. All spaces shall be mechanically ventilated to protect occupants from application and installation of odor causing materials.
  - 4. The permanent ventilation system shall be fully operational and run full time for a minimum of 2 weeks before date established for Substantial Completion. Cost of operation shall be included as part of the work.

- I. **Electric Power Service:** Refer to Division 26 for requirements.
- J. **Electric Power Service:** Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- K. **Electric Power Service:** Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  - 1. Install electric power service [**overhead**] [**underground**] unless otherwise indicated.
  - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- L. **Lighting:** Refer to Division 26 for requirements.
- M. **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.
- N. **Telephone Service:** Provide temporary telephone service in common-use facilities for use by all construction personnel.
  - 1. 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.
  - 2. Provide an answering service on superintendent's telephone.
- O. **Internet Service:** Provide high-speed internet service to 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 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. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.
- D. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated. Include name of project, and names of Owner, Architect and Contractor. **[Comply with details indicated on the sketch attached to the end of this section.]**
  2. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in size of 4 by 8 feet and 3/4 inch thickness, unless otherwise indicated. Support on posts or framing of preservative-treated wood or steel.
  3. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
  4. 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.
  5. Maintain and touchup signs so they are legible at all times.
- E. **[Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."]**
- F. 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 017300 "Execution."
- G. 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.
- H. Temporary Elevator Use: Use of elevators is not permitted [See Section 142100 "Electric Traction Elevators," Section 142113 "Electric Traction Freight Elevators," Section 142400 "Hydraulic Elevators," Section 142413 "Hydraulic Freight Elevators," and Section 142600 "Limited-Use/Limited-Application Elevators" for temporary use of new elevators].
- I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

- J. 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.
  - 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. **[Temporary Erosion and Sedimentation Control: Comply with requirements specified in Section 312500 "Erosion and Sedimentation Control"]**
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- G. 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.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- J. **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.
- K. 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.
- L. 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 hoses for fire protection of sufficient length to reach construction areas. 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: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
  2. 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.
  3. Indicate methods to be used to avoid trapping water in finished work.
- 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 temporary heating system, [or permanent HVAC system if allowed by Owner](#), to control humidity within ranges specified for installed and stored materials.
  - 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



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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. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000



SECTION 016000 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
- 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: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1. Keep building materials dry. Wood, porous insulation, paper, fabric, and similar absorptive materials shall be kept dry to prevent the growth of mold and bacteria. Cover these materials to prevent rain damage, and if resting on the ground, use spacers to allow air to circulate between the ground and the materials.
2. Replace water-damaged materials, or dry within 24 hours, due to the possibility of mold and bacterial growth. Materials that are damp or wet for more than 24 hours shall be discarded if evidence of mold occurs.
3. Immediately remove materials showing signs of mold and mildew, including materials with exposed moisture stains, from the site and properly dispose of them. Replace moldy materials with new, undamaged materials.
4. Require that moisture sensitive materials be delivered dry and protected from the elements.
5. Allow for time in the construction schedule for materials to dry before they are enclosed.

## 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.
  1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
  1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved substitute" or approved," comply with provisions in "Product Substitutions" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Substitutions for Contractor's convenience will not be considered.
3. Products:
  - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Substitutions for Contractor's convenience will be considered, unless otherwise indicated.
  - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product.
4. Manufacturers:
  - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Substitutions for Contractor's convenience will be considered, unless otherwise indicated.
  - b. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed manufacturer.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics

that are based on the product named. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product or manufacturer.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000





SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

- 1. **Construction layout.**
- 2. Field engineering and surveying.
- 3. Installation of the Work.
- 4. Cutting and patching.
- 5. Progress cleaning.
- 6. Starting and adjusting.
- 7. Protection of installed construction.

- B. Related Requirements:

- 1. Section 011000 "Summary" for limits on use of Project site.
- 2. Section 013300 "Submittal Procedures" for submitting surveys.
- 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
- 4. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **[land surveyor]** **[professional engineer]**.
- B. Certificates: Submit certificate signed by **[land surveyor]** **[professional engineer]** certifying that location and elevation of improvements comply with requirements.

- C. Cutting and Patching Plan: Submit plan describing procedures at least **[10]** **<Insert number>** days prior to the time cutting and patching will be performed. Include the following information:
  - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
  - 4. Dates: Indicate when cutting and patching will be performed.
  - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit **[two]** **<Insert number>** copies signed by **[land surveyor]** **[professional engineer]**.
- F. Final Property Survey: Submit **[10]** **<Insert number>** copies showing the Work performed and record survey data.

#### 1.5 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.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
  - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: 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, mechanical and electrical systems, 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; underground electrical services, and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. 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 Owner 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. 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.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

### 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**] [**professional engineer**] 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 limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

7. 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 rim 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]** **<Insert number>** 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. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a **[land surveyor]** **[professional engineer]** to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by **[land surveyor]** **[professional engineer]**, 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.
- 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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  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.
  3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

- a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
  - b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- 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.



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- a. Clean interior spaces prior to the start of finish painting, and continue cleaning on an as-needed basis until painting is finished.
  - b. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.
3. Remove materials and debris that create tripping hazards.
- D. For general construction, each trade shall pick up the debris and rubbish, generated by that trade, and dispose of in dumpsters furnished by the General Contractor.
  - E. 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.
  - F. Concealed Spaces: Remove dirt, debris and garbage from concealed spaces, including stud cavities before enclosing the space.
  - G. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
  - H. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
  - 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.

### 3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- 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: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 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.
- C. Protect resilient flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.
  - 1. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.
  - 2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- D. Protect roofing materials against cuts, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period.
  - 1. Do not move heavy and sharp objects directly over roof surfaces. Place plywood or hardboard panels over roofing and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 017300

SECTION 017700 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

- 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
- 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
- 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
  - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
- 5. Submit test/adjust/balance records.
- 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

- 1. Advise Owner of pending insurance changeover requirements.
- 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
- 3. Complete startup and testing of systems and equipment.
- 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
- 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- 6. Advise Owner of changeover in heat and other utilities.

7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements, including touchup painting.
  10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. 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.

#### 1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect 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.

#### 1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

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

#### 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
  1. Unless indicated otherwise, all warranties shall commence on the date of Substantial Completion.
- 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 Project Manual.
  1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper. Submit final warranties as a package for the entire project, assembled and identified as described below.
  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.
  4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.
- E. Warranty Response Time: The Contract shall respond and begin to take necessary action within 7 days of receipt of written notification from the Owner. Response time for life safety items,

and for building perimeter security shall be within 24 hours of receipt of written notification from the Owner.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

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

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. 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. Remove snow and ice to provide safe access to building.
    - f. 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.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

- j. Resilient flooring shall be scrubbed and cleaned with cleaner recommended by the flooring manufacturer just prior to occupation by Owner. No-wax floors shall be cleaned and buffed in accordance with flooring manufacturer's requirements.
  - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces. Cleaning of windows shall be done just before Owner occupancy.
  - l. Remove labels that are not permanent.
  - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - 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 or that display contamination with particulate matter on inspection.
    - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
  - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
  - r. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
  - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
  - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.



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4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700



SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  2. **One paper copy.** Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
  2. List of systems.
  3. List of equipment.
  4. Subcontractor list.
  5. Warranties
  6. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the

Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor and primary subcontractors.
  6. Name and contact information for Architect.
  7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily

navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. **Manuals, Paper Copy:** Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
  - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
  - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts. Maximum size of drawings to be included in the binders shall not exceed 11-by-17-inch.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

### 2.3 EMERGENCY MANUALS

- A. Emergency operations and shutdown information that must be immediately available during emergency situations to protect life and property and to minimize disruptions to building occupants.
- B. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

- C. Operating Procedures: Include the following, as applicable:
  - 1. Startup procedures.
  - 2. Equipment or system break-in procedures.
  - 3. Routine and normal operating instructions.
  - 4. Regulation and control procedures.
  - 5. Instructions on stopping.
  - 6. Normal shutdown instructions.
  - 7. Seasonal and weekend operating instructions.
  - 8. Required sequences for electric or electronic systems.
  - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.



- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

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

- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

### PART 3 - EXECUTION

#### 3.1 MANUAL PREPARATION

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

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2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823



SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 CLOSEOUT SUBMITTALS

- A. Submit all project record documents as one submittal package.
- B. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set of marked-up record prints.
- C. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.
- D. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding archive photographic documentation.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT RECORD DRAWINGS."
  - d. Name of Architect.
  - e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

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

## 2.3 RECORD PRODUCT DATA

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

## 2.4 DIRECTORIES

- A. Directories: Contractor/Subcontractor directory.

1. Submit one hard copy and one copy on electronic media CD-R or USB storage device in PDF format.
- B. Directory: Name, address and telephone number for General Contractor, all major subcontractors, organized by specification section. Provide a separate list in alphabetical order.

## 2.5 MISCELLANEOUS RECORD SUBMITTALS

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

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

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

END OF SECTION 017839



SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.

2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.5 COORDINATION

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

### PART 2 - PRODUCTS

#### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
  1. Motorized doors, including overhead coiling doors and automatic entrance doors.
  2. Fire-protection systems, including fire alarm fire pumps and fire-extinguishing systems.
  3. Intrusion detection systems.
  4. Conveying systems, including elevators.
  5. Heat generation, including boilers pumps and water distribution piping.
  6. Refrigeration systems, including condensers pumps and distribution piping.
  7. HVAC systems, including air-handling equipment air distribution systems and terminal equipment and devices.
  8. HVAC instrumentation and controls.
  9. Electrical service and distribution, including transformers switchboards panelboards uninterruptible power supplies and motor controls.
  10. Packaged engine generators, including transfer switches.
  11. Lighting equipment and controls.
  12. Communication systems, including intercommunication clocks and programming voice and data and television equipment.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

- a. System, subsystem, and equipment descriptions.
  - b. Performance and design criteria if Contractor is delegated design responsibility.
  - c. Operating standards.
  - d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.
  - g. Limiting conditions.
  - h. Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project record documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

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

#### 3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  2. Owner will furnish an instructor to describe Owner's operational philosophy.
  3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written or a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### 3.3 DEMONSTRATION AND TRAINING SCHEDULE

- A. Demonstration of equipment includes, but is not limited to, the following:
  - 1. Sectional overhead doors.
- B. Demonstration and training with video recording of equipment includes, but is not limited to, the following:
  - 1. HVAC equipment and systems.
  - 2. Electrical equipment and systems.

END OF SECTION 017900



SECTION 02 32 00 - GEOTECHNICAL INVESTIGATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes geotechnical investigations.

1.2 DESCRIPTION

- A. Subsurface explorations have been done at the location of the project and soils reports have been compiled for the purpose of guidance in the design of the project facilities. This work can include open excavation test pits, observation wells and soil borings.
- B. The logs are not intended to indicate subsurface conditions except at the locations of the exploration (at the time explorations were made) and any interpretation the Contractor may make is his responsibility.
- C. The subsurface investigations of the site were made in conjunction with design of the facility to be constructed under this Contract. Portions of this investigation are presented in reports which are a part of the Contract Documents. The reports present the opinion of the Geotechnical Engineer and shall not be interpreted to prescribe or dictate construction procedures or relieve the Contractor in any way of his responsibility for the construction. The explorations are shown on the drawings and the logs are include in Appendix A.
- D. The water levels shown on the log at the exploration locations are based on observations made by the Field personnel at the same time the explorations were made and may or may not represent the groundwater surface in the immediate vicinity of the explorations. They are presented only as an observation of the free-standing water surface in the exploration on the date noted.
- E. The refusal depths shown at the exploration locations indicate only, that in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impractical by the procedures and equipment being used. Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man- made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 02 32 00

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*The key to success starts with a solid foundation.*  
**ENGINEERING | EXPLORATION | EXPERIENCE**

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# Geotechnical Report

*Proposed Apartment Building  
221 Congress Street, Portland, Maine*



## **Client**

Caleb Johnson Architects + Builders  
265 Main St. #201  
Biddeford, Maine 04005

**Project #: 16231**

**Date: 6/22/17**



June 22, 2017  
Summit #16231

Attn: Patrick Boothe, AIA, LEED AP BD+C  
Caleb Johnson Architects + Builders  
265 Main St. #201  
Biddeford, Maine 04005

Reference: Geotechnical Engineering Report – Proposed Apartment Building  
221 Congress Street, Portland, Maine

Dear Patrick;

Summit Geoengineering Services, Inc. (SGS) completed a geotechnical exploration at the above referenced site in 2009 and prepared a geotechnical report for the design and construction of previously proposed restaurant. The scope of services at that time included the drilling of 4 borings at various locations throughout the property, performing laboratory testing on collected soil samples, and preparing the geotechnical report. The restaurant which was referenced in that report was not built.

Recently, SGS was asked to provide geotechnical recommendations for newly proposed construction of an apartment building at the site. The recommendations provided within this geotechnical report are based upon the previous explorations performed by SGS at the site and are contingent upon a site visit during construction to observe the subgrade conditions.

## 1.0 Project and Site Description

We understand that the project consists of the construction of a new 5 story apartment building at the corner of Congress Street and Washington Street in Portland, Maine. Based on a preliminary plan set provided by you (dated 9/30/16), the proposed building will have a footprint of 5,514 square feet and will be constructed adjacent to the existing building called “The Snug” to the west and The Big Apple to the north. We understand that there will be a partial basement used for automatic car port parking, the first floor will be used for commercial space, and the 2<sup>nd</sup> through 5<sup>th</sup> floor will be residential living units.

The car port basement will be located along the western edge of the proposed building, adjacent to The Snug and The Big Apple. Based on discussions with you, we understand that a cut of approximately 17 feet will be required for the construction of the basement. At this time, we understand that the bracing method for this cut is unknown. Consideration is being given to

bracing methods such as soldier pile and lagging, cantilever sheeting, sheeting with soil anchors, sheeting with rakers, and others. We also understand that The Snug has a basement with a FFE approximately 8 feet below existing grade.

## 2.0 Subsurface Explorations and Laboratory Testing

### 2.1 Subsurface Explorations

SGS observed the subsurface conditions at the site with the drilling of 4 borings on January 2, 2009. All explorations were performed by Northern Test Boring, under direct supervision of SGS, using a Diedrich D-50 tracked drill rig. All of the borings (B-1 through B-4) were terminated in the native glacial till at a depth of 27 feet below ground surface. All borings were advanced using 2 ½" I.D. hollow stem augers. During the borings, split spoon sampling (*ASTM D1586*) was performed at 5 foot intervals.

The borings were located by SGS prior to drilling by taping/pacing from existing features. These locations can be seen in the SGS Exploration Plan in Appendix A. The boring logs can be found in Appendix B.

### 2.2 Laboratory Testing

Two Grain Size Analyses (*ASTM D422*) were performed on samples of glacial till soil collected in Boring B-3. The tested samples were collected at depths of 15' to 17' and 20' to 22'. A summary of the results are presented below. Detailed results can be found in Appendix C.

Table 1: Laboratory Test Results

GRAIN SIZE ANALYSIS RESULTS – FILL/REWORKED NATIVE						
Boring	Sample	Depth (ft.)	Composition			USCS
			Gravel	Sand	Silt/Clay	
B-3	S-6	15 to 17	1.2%	95.0%	3.8%	SP
B-3	S-7	20 to 22	0.0%	84.0%	16.0%	SM

USCS = Unified Soil Classification System, SP = Poorly Graded Sand, SM = Silty Sand

## 3.0 Subsurface Conditions

### 3.1 Soil and Groundwater

In general, the soils encountered at the site consisted of *fill* overlying *glacial till*. Pavement, approximately 2-1/2" thick, was encountered at B-1, B-2, and B-3.

**Fill** encountered at all boring locations ranged from 3 to 7.5 feet in thickness. The fill is described as brown to dark brown silty sand or sand with pieces of bricks and ashes. The fill was generally competent and no organic, trash, or other similar materials were encountered. SPT-N values in the fill ranged from 2 to 23 blows per foot and averaged 10 bpf. A very loose layer was encountered from 5 to 7 feet at B-3, underlying a thin wood layer encountered at 5 feet. The fill was dry and is classified as SM or SP in accordance with the USCS (Unified Soil Classification System).

The **Glacial Till** encountered at the site ranged from brown sand with a little gravel to gray fine sand with a little silt. Based on the results of the grain size the glacial till at B-3 from a depth of 15 to 20 feet, has 0% to 1.2% gravel, 84% to 95% sand, and 3.8% to 16% silt. These samples represent the finer range of the sediments observed in the samples. The SPT-N values for the glacial till range from 7 to 30 bpf and averaged 15 bpf. The glacial till classification ranges from SP to SM in accordance with the USCS.

**Bedrock** was not encountered in the borings, drilled to a depth of 27 feet.

The depth to Groundwater, based on observation of the samples obtained in the borings, ranged from 15 feet to 20 feet below the existing ground surface. Groundwater levels are expected to fluctuate seasonally and groundwater at this site may be higher during prolonged wet periods.

## 4.0 Geotechnical Evaluation

Based on our understanding of the proposed project, we believe that the new building and the associated development is feasible from a geotechnical standpoint. The building can be constructed using conventional spread footings on frost wall with a slab-on-grade. The proposed excavation support should be designed using the recommendation provided in this report. The geotechnical challenges associated with the proposed development include:

- A deep excavation for the construction of the new building foundation.
- Support of the existing basement foundation adjacent to the deep excavation.

- Presence of groundwater within the building foundation excavation
- Presence of groundwater at and above the basement finish floor elevation (FFE).

A deep excavation will be required to construct the basement portion of the new building foundation. Based on discussions with you and an excavation contractor, we understand that the bracing scheme may involve sheeting or soldier pile & lagging braced with soil tiebacks or rakers. Geotechnical design parameters for shoring designs have been provided in Section 6.0. If additional recommendations are needed based on updated or refined concepts, we should be notified in order to provide these. Also, final design computations for the shoring and retaining walls should be provided to us for review so we can verify that the assumed soil and water conditions match the recommendations provided in this report.

The deep excavation will be directly adjacent to the existing basement foundation of The Snug and The Big Apple. These foundations must be adequately supported during construction. The two options for supporting the foundations include:

- 1) Directly underpinning the existing foundation.
- 2) Designing a shoring system to rigidly support the existing foundation.

Underpinning will involve the installation of an independent load-bearing system of the existing foundation to carry the loads beneath the excavation depth. This will likely consist of a system such as micropiles, mass concrete underpinning, jet grouting, or others. If the foundation is not underpinned, the shoring system should be designed to support the load from the existing foundation and to minimize vertical and lateral movements of the soil beneath the foundation.

In both cases, we anticipate that structural monitoring of the adjacent buildings will be required before and during construction to verify that vibrations and excavation activities do not impact the existing foundations.

Groundwater was encountered at depths ranging from 15 to 20 feet below ground surface on the day of the explorations. These groundwater depths are anticipated to fluctuate over the life of the building. We anticipate that groundwater will be encountered within the building excavation and will require de-watering for construction. Groundwater will also have to be considered in the design of the basement floor slab and retaining walls.

## 5.0 Geotechnical Recommendations – Proposed Building Foundation

### 5.1 Foundation Bearing Pressure

Based on the proposed grades, we anticipate that the native glacial till soil or existing fill will be exposed beneath footings for the building. Assuming that the recommendations below are followed, an allowable bearing pressure of 4,000 psf can be used to proportion the footings for the new building. If the recommendations provided below are followed, we anticipate that post construction total settlement will be less than 1 inch and differential settlement within the building will be less than a deflection of  $1/300$  ( $\delta/L$  deflection divided by span length) between column footings. The following recommendations apply to the footings construction at both sites:

- All topsoil, pavement, and existing building elements are removed from within the proposed building footprint prior to excavation of the footing trenches.
- All footings exposed to freezing temperatures are constructed at the recommended frost protection depth of 4.0 feet below exterior finish grade. Interior footings in heated areas should be constructed at a minimum depth of 2.0 feet below FFE.
- The exposed soil at the bottom of footing trenches is proofrolled with a minimum of 4 passes with a large plate compactor or vibratory roller. Proofrolling should be performed on dry, unfrozen soils. The groundwater surface should be dewatered a minimum of 12" below the bottom of the new footings during proofrolling and construction of the footings.
- If soft/unsuitable soils or man-made materials are encountered at the bottom of the excavation, they should be removed and replaced with  $3/4$ " crushed stone prior to proofrolling. If a significant amount of soft/unsuitable soils are encountered, SGS should be notified.

### 5.2 Frost Protection

The design air freezing index for the Portland area is approximately 1,200 degree F days (10 year, 90% probability). Based on this, a total of 4.0 feet of frost protection should be provided for the exterior footings and interior footings exposed to freezing temperatures. Interior footings constructed in continuously heated areas can be constructed a depth of 2.0 feet below interior grade.

We recommend that the exterior of all foundation elements exposed to freezing temperatures be backfilled with Foundation Backfill (FB). The portion of FB passing the 3" sieve size should meet the following gradation requirements:

Table 2: Foundation Backfill - Soil Gradation

FOUNDATION BACKFILL	
Sieve Size	Percent Finer
3 inch	100
¼ inch	25 to 100
No. 40	0 to 50
No. 200	0 to 6*

Reference: MDOT Specification 703.06, Type E (2014)

\*Reduced from 7% to 6% from Type E Standard

Maximum particle size should be limited to 6 inches. Foundation backfill should be placed in 6 to 12 inch lifts and compacted to 95% of its optimum dry density determined in accordance with ASTM D1557. The compaction requirement can be reduced to 90% beneath landscaped areas.

### 5.3 Seismic Design

Based on the summary of field results we recommend Site Class D be used in accordance with the 2012 or 2015 International Building Code. The following seismic site coefficients should be used:

Table 3: Seismic Design Coefficients

SUBGRADE SITE SEISMIC DESIGN COEFFICIENTS - IBC	
Seismic Coefficient	Site Class D
Short period spectral response ( $S_s$ )	0.240
1 second spectral response ( $S_1$ )	0.078
Maximum short period spectral response ( $S_{MS}$ )	0.385
Maximum 1 second spectral response ( $S_{M1}$ )	0.187
Design short period spectral response ( $S_{DS}$ )	0.256
Design 1 second spectral response ( $S_{D1}$ )	0.125

Subgrade conditions are not considered susceptible to liquefaction during seismic events.

## 5.4 Groundwater Control

Groundwater in the borings was encountered at or near the proposed basement floor elevation during the exploration. Groundwater is expected to rise but we do not expect it to rise significantly above the basement floor level. We recommend an underdrain be installed along the exterior foundation wall at the basement footing. Perimeter under-drains should consist of 6 inch rigid perforated PVC placed adjacent to the footing and surrounded by a minimum of 6 inches of crushed stone wrapped in filter fabric to prevent clogging from the migration of the fine soil particles in the foundation backfill soils. The under-drain pipe should be outlet to a location where it will be free flowing. Where exposed at the ground surface, the ends of pipes should be screened or otherwise protected from entry and nesting of wildlife, which could cause clogging. If the grades do not allow a gravity outlet, a sump and pump would be required. If a sump pump is used to permanently dewater the basement, we recommend that a redundant system be installed to accommodate any failures of the primary sump or during power outages. In this case the basement slab does not need to be designed to account for hydrostatic pressure.

Alternatively, the underdrain can be placed as low as possible to attain a gravity outlet. Portions of the basement walls below the underdrain should be waterproofed and designed to accommodate the pertinent lateral water pressure. The slab should be designed to support the excess hydrostatic pressure equal to the unit weight of water times the distance from the bottom of the basement slab to the underdrain. Joints between the slab and foundation walls should be sealed to preclude water seepage.

## 5.5 Slab-on-Grade and/or Pavement

This section provides recommendations for a concrete slab-on-grade or pavement surface in the event that both types of surface are used for the floor area. Additionally, this section will provide recommendations for both heated and unheated conditions. We anticipate that native glacial till will be exposed in the slab excavation for the basement and that existing fill will be exposed in the first floor slab excavation.

### 5.5.1 Concrete Slab-on-Grade

We recommend that the concrete slabs for the new building be constructed on a minimum of 12" of Structural Fill (SF, see table below) or  $\frac{3}{4}$ " crushed stone. The glacial till or existing fill soil exposed in the slab excavation should be proofrolled with a minimum of 4 passes with a vibratory roller. If the exposed soil becomes softened from exposure to water (i.e., rain water, surface runoff, seeping groundwater, etc.), all softened areas should be overexcavated and

replaced with ¾” crushed stone. For exterior slabs or slabs in unheated areas, the slab subgrade thickness should be increased to 24” and the slab should be constructed on 2” of rigid insulation. Alternatively, the subgrade soil thickness could be increased to 48” (including the slab) if rigid insulation is not used to provide adequate frost heave protection.

The portion of SF passing the 3” sieve shall meet the following gradation requirements:

*Table 4: Structural Fill - Soil Gradation*

STRUCTURAL FILL (SF)	
Sieve Size	Percent finer
3 inch	100
½ inch	35 to 80
¼ inch	25 to 65
No. 40	0 to 30
No. 200	0 to 7

**Reference:** MDOT Specification 703.06, Type D

The maximum SF particle size should be limited to 6 inches. Structural Fill should be placed in 6 to 12 inch lifts and should be compacted to a minimum of 95 percent of its maximum dry density, determined in accordance with ASTM D1557. If ¾” crushed stone is used, it should be placed in 12” lifts and be compacted with a minimum of 4 passes in each of two perpendicular directions with a vibratory roller. For the conditions described above, the slab can be designed using a subgrade modulus value of 175 pci.

### 5.5.2 Pavement

The mean annual freezing index for the Portland area is estimated at 900 degree days. Based on the subgrade and mean annual freezing index, the anticipated mean annual frost penetration depth is 36 inches.

We recommend a minimum total section thickness of 18 inches for pavement in unheated areas. We further recommend that the pavement section consist of the following materials:



Table 5: Pavement Section Thicknesses

MATERIAL	THICKNESS (in)	SPECIFICATION
Asphalt Surface Course	1	MDOT 703.09 Type 9.5 mm or Type 12.5 mm
Asphalt Binder Course	2	MDOT 703.09 Type 19 mm
Base Soil	3	MDOT 703.06 Type A
Subbase Soil	12	MDOT 703.06 Type D

The Subbase soil thickness can be reduced to 6" if the area is continuously heated. For portions of the pavement subjected to light traffic loads of cars and light trucks we recommend MDOT Type 9.5mm surface course. The following specifications are for MDOT base and subbase gravel:

Table 6: Pavement Base and Subbase Gradations

SIEVE SIZE	Percent Passing a 3-inch Sieve	
	MDOT Type A (Base)	MDOT Type D (Subbase)
3 Inch	100	100
2 Inch	100	--
½ Inch	45 – 70	35 – 80
¼ Inch	30 – 55	25 – 65
No. 40	0 – 20	0 – 30
No. 200	0 – 6	0 – 7

**Reference:** MDOT Specification 703.06, Aggregate for Base and Subbase (2014)

The recommendations above can be used for exterior pavement areas.

## 6.0 Retaining Wall Design Recommendations

The following table presents soil parameters to be used in the structural design of the shoring systems and the foundation retaining walls:

Table 7: Retaining Wall Design Parameters

GEOTECHNICAL PARAMETERS – RETAINING WALL DESIGN				
PARAMETER	EXISTING FILL	GLACIAL TILL	<sup>1</sup> STRUCTURAL FILL	<sup>1</sup> FOUNDATION BACKFILL
<i>Elevation Top</i>	<i>Ground Surf.</i>	74.0 ft.	N/A	N/A
<i>Elevation Bottom</i>	74.0 ft.	54.0 ft.	N/A	N/A
Total Unit Weight ( $\gamma_t$ )	125 pcf	130 pcf	135 pcf	130 pcf
Submerged Unit Weight ( $\gamma_B$ )	63 pcf	68 pcf	73 pcf	68 pcf
Effective Friction Angle ( $\phi'$ )	32°	36°	34°	32°
Cohesion (c)	0 psf	0 psf	0 psf	0 psf
Interface Friction Angle ( $\delta$ ), Precast Conc.	17°	22°	24°	22°
Interface Friction Angle ( $\delta$ ), C.I.P. Conc.	20°	26°	28°	26°
Interface Friction Angle ( $\delta$ ), Wood	19°	24°	25°	24°
Interface Friction Angle ( $\delta$ ), Steel	20°	22°	24°	20°
Adhesion ( $c_a$ )	0 psf	0 psf	0 psf	0 psf

<sup>1</sup>**Note:** Soil Parameters for Structural Fill and Foundation Backfill assume that the fill is placed in 12" maximum lifts and compacted to 95% of the dry density in accordance with ASTM D1557

Active and passive earth pressures can be calculated based on the above soil properties and the corresponding backslope/toeslope angles behind and in front of the walls. Earth pressures can be calculated using the Rankine or the Coulomb theories, whichever the designer feels is more appropriate. The Rankine theory will provide a more conservative coefficient than the Coulomb theory (wall batter and soil-wall interface friction are ignored using Rankine). Equivalent fluid pressure on the foundation walls can be computed by multiplying the applicable earth pressure coefficient by the soil unit weight.

Active earth pressure can be used for computing soil load on walls which are designed to anticipate a horizontal deflection of the following magnitude:

*Table 8: Required Deflections for Active Earth Pressure Design*

RETAINED SOIL	REQUIRED DEFLECTION (% of Total Height)
Native Glacial Till	0.10% of total wall height
Structural Fill	0.20% of total wall height
Existing Fill	0.20% of total wall height
Foundation Backfill	0.20% of total wall height

If the proposed retaining wall is restricted against horizontal deflection or is not designed to accommodate the deflections in the table above, at-rest earth pressure should be used in the wall design. We anticipate that the shoring system design will use at-rest earth pressures (to limit soil movement) if the existing foundation is not underpinned.

## 7.0 Earthwork Considerations

The table below summarizes the OSHA general excavation guidelines for occupied excavations for the soils encountered in our geotechnical explorations.

*Table 9: OSHA Permissible Slopes*

OSHA Excavation Slopes		
Soil	OSHA Classification	Permissible Slope
Existing Fill & Glacial Till	Type C	1.5H:1V

Any excavations greater than 20 feet should be designed by a qualified Maine Licensed Professional Engineer.

It is possible that the native glacial till will meet the gradation requirements for Foundation Backfill (FB). If it is desired to reuse the glacial till as FB, representative samples of the excavated soil should be obtained and a grain size analyses should be performed to check its conformance to the FB specification provided in this report. We anticipate that the glacial till will not be able to be used as Structural Fill.

Surface water should be redirected from excavation areas. Where softened, we recommend the subgrade at the base of the excavation be over-excavated and replaced with a minimum of 12 inches of Crushed Stone. Crushed Stone should be should be tamped to lock the stone structure together. Crushed Stone should meet the following gradation specification:

Table 10: 3/4" Crushed Stone Gradation

CRUSHED STONE ¾ INCH	
Sieve Size	Percent finer
1 inch	100
¾ inch	90 to 100
½ inch	20 to 55
⅜ inch	0 to 15
No. 4	0 to 5

**Reference:** MDOT Specification 703.13, Crushed Stone ¾-Inch (2014)

In general, we anticipate that groundwater will enter the deeper excavations. Dewatering may consist of shallow sumps at the base of the excavation. Diversion and control of surface water should be performed to prevent water flow from rain or snowmelt from entering the excavations. Consideration should be given to where sump pump outlets are located to prevent flooding of the site or adjacent site.

We recommend that a qualified geotechnical consultant be retained to monitor and test soil materials used during construction and confirm that soil conditions and construction methods are consistent with this report.

## 8.0 Closure

Our recommendations are based on professional judgment and generally accepted principles of geotechnical engineering and project information provided by others. Some changes in subsurface conditions from those presented in this report may occur. Should these conditions or the proposed development differ from those described in this report, SGS should be notified so that we can re-evaluate our recommendations.

We highly recommend that all retaining wall designs be made available to SGS for review in order to verify that the design conditions are consistent with the recommendations provided in this report.

The recommendations provided within this geotechnical report are based upon the previous explorations performed by SGS at the site and are contingent upon a site visit during construction to observe the existing subgrade conditions prior to placing concrete formwork.

It is recommended that this report be made available in its entirety to contractors for informational purposes and be incorporated in the construction Contract Documents. We

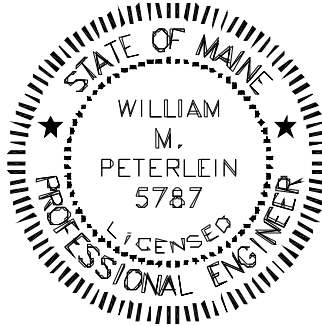
recommend that SGS be retained to review final construction documents relevant to the recommendations in this report.

We appreciate the opportunity to serve you during this phase of your project. If there are any questions or additional information is required, please do not hesitate to call.

Sincerely yours,



Mathew Hardison, EI  
Geotechnical Engineer



William M. Peterlein, PE  
President & Principal Engineer

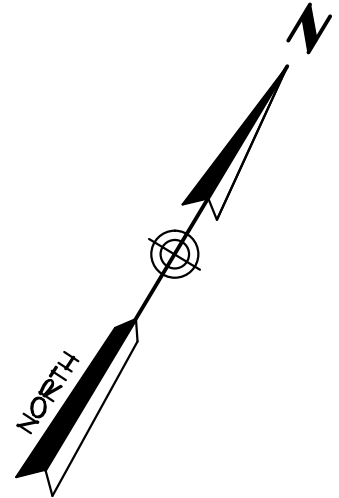
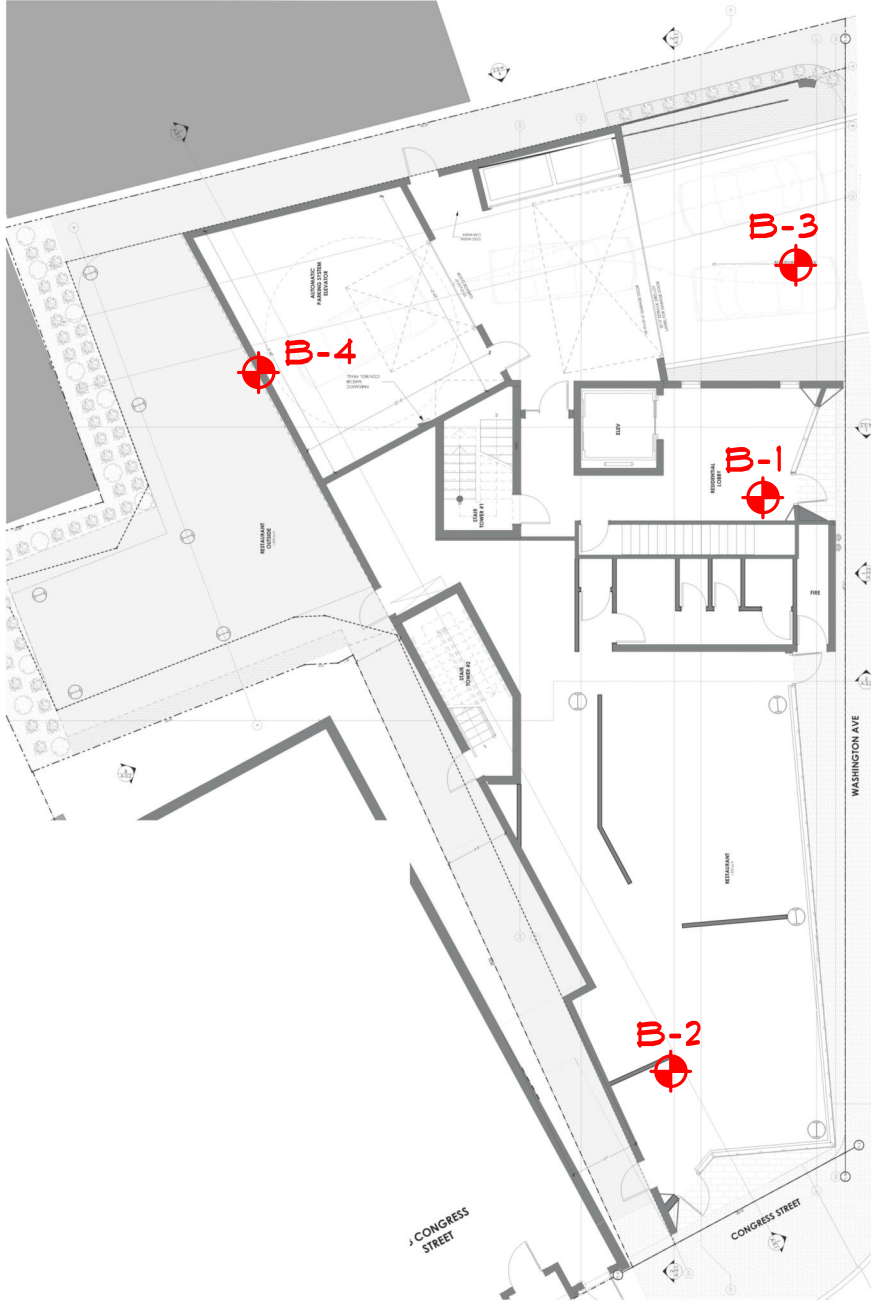
**APPENDIX A**  
BORING LOCATION PLAN

# LEGEND

 **B-1** SUMMIT TEST BORING  
(JANUARY 2, 2009)

# PLAN REFERENCE

"FIRST FLOOR PLAN, 221 CONGRESS STREET",  
DATED MARCH 28, 2017, PREPARED BY  
CALEB JOHNSON ARCHITECTS & BUILDERS.



## TEST BORING LOCATION PLAN PROPOSED APARTMENT BUILDING

221 CONGRESS STREET - PORTLAND, MAINE

PREPARED FOR

**CALEB JOHNSON ARCHITECTS + BUILDERS**

145 LISBON ST. - SUITE 101  
LEWISTON, ME 04240  
Tel.: (207) 576-3313

173 PLEASANT STREET  
ROCKLAND, ME 04841  
Tel.: (207) 318-1161

# SUMMIT

GEOENGINEERING SERVICES  
[www.summitgeoeng.com](http://www.summitgeoeng.com)

DATE: 6-22-2017	DRAWN BY: KRF	CHECKED BY: UMP
JOB: 16231	SCALE: 1" = 20'	FILE: 16231 BOR

**APPENDIX B**  
BORING LOGS



<b>SUMMIT GEOENGINEERING SERVICES</b> 640 Main Street Lewiston, Maine 04240				<b>SOIL BORING LOG</b>			Boring #: <b>B-1</b>
Project: Bingas Wingas Restaurant 6 Washington Avenue Portland, Maine				Project #: 17443			Sheet: 1 of 1
Prep by: WMP				Ground Elevation: 81 ft +/-			Date started: 1/2/2009 Date Comp: 1/2/2009
Drilling Co: Northern Test Borings				Reference: Site Plan prepared by Associated Design Partners			
Foreman: M. Nadeau				Date started: 1/2/2009 Date Comp: 1/2/2009			
Summit: B. Peterlein, P.E.							
DRILLING METHOD		SAMPLER		GROUND WATER DEPTH			
Vehicle: Trailer	Type: 24" SS			Date	Depth	Elevation	Comments
Model: Deidrich D50	Hammer: 140 lb			1/2/2009	15 ft	66 ft +/-	Wet sample
Method: 2-1/2" H.S.A.	Fall: 30"						
Depth (ft.)	SAMPLE DATA				ENGINEERING DESCRIPTION	GEOLOGIC DESCRIPTION	
	No.	Pen/Rec (in.)	Depth (ft)	Blows			
1	S-1	24/18	0 to 2	17	2-1/2' Pavement Dark brown Silty SAND mixed with brick, ashes, compact, moist, SM	FILL	
				7			
				9			
2				9			
				9			
3	S-2	24/20	2 to 4	4			
				3			
4				5	Brown SAND, little Gravel, compact, moist to damp, SP	GLACIAL TILL	
				12			
5							
6	S-3	24/20	5 to 7	9	Brown SAND, trace to little Gravel, compact, moist to damp, SP		
				15			
7				15			
				19			
8							
9							
10							
11	S-4	24/24	10 to 12	4	Same as S-3		
				4			
12				5			
				8			
13							
14							
15							
16	S-5	24/24	15 to 17	5	Same as S-3, wet		
				5			
17				9			
				11			
18							
19							
20							
21	S-6	24/24	20 to 22	7	Brown fine SAND, trace to little Silt, compact, wet, SP or SM		
				7			
22				7			
				10			
23							
24							
25							
26	S-7	24/24	25 to 27	6	Same as S-6		
				5			
27				4			
				6			
				End of Boring at 27 ft			

<b>SUMMIT GEOENGINEERING SERVICES</b> 640 Main Street Lewiston, Maine 04240				<b>SOIL BORING LOG</b>			Boring #: <b>B-2</b>
Project: Bingas Wingas Restaurant				Project #: 17443			
6 Washington Avenue Portland, Maine				Sheet: 1 of 1			
Prep by: WMP				Date started: 1/2/2009 Date Comp: 1/2/2009			
Drilling Co: Northern Test Borings				Ground Elevation: 81 ft +/-			
Foreman: M. Nadeau				Reference: Site Plan prepared by Associated Design Partners			
Summit: B. Peterlein, P.E.				Date started: 1/2/2009 Date Comp: 1/2/2009			
DRILLING METHOD		SAMPLER		GROUND WATER DEPTH			
Vehicle: Trailer	Type: 24" SS	Date	Depth	Elevation	Comments		
Model: Deidrich D50	Hammer: 140 lb	1/2/2009	20 ft	61 ft +/-	Wet sample		
Method: 2-1/2" H.S.A.	Fall: 30"						
Depth (ft.)	SAMPLE DATA				ENGINEERING DESCRIPTION	GEOLOGIC DESCRIPTION	
	No.	Pen/Rec (in.)	Depth (ft)	Blows			
1	S-1	24/24	0 to 2	34	2-1/2' Pavement	FILL	
				14	Brown SAND, little Gravel, compact, dry, SP		
				9			
2				6	Brown to dark brown SAND, little Silt, trace Gravel, trace brick pieces, ashes, moist, SM		
				3			
3	S-2	24/20	2 to 4	3			Same as S-2
				3			
4				4		Tannish-brown SAND, trace to little Silt loose, moist, SP	
				4			
5							
6	S-3	24/18	5 to 7	3	Brown SAND, trace to little Gravel, clean, loose, dry, SP		
				3			
7				3			Same as S-4
				3			
8							
9							
10							
11	S-4	24/18	10 to 12	3	Brown medium to fine SAND, trace Silt, loose, wet, SP		
				4			
12				4		Same as S-6	
				6			
13							
14							
15							
16	S-5	24/24	15 to 17	9	Same as S-6		
				9			
17				10		Same as S-6	
				12			
18							
19							
20							
21	S-6	24/20	20 to 22	5	Same as S-6		
				5			
22				4		Same as S-6	
				8			
23							
24							
25							
26	S-7	24/24	25 to 27	4	Same as S-6		
				5			
27				3		End of Boring at 27 ft	
				2			

<b>SUMMIT GEOENGINEERING SERVICES</b> 640 Main Street Lewiston, Maine 04240				<b>SOIL BORING LOG</b>			Boring #: <b>B-3</b>
Project: Bingas Wingas Restaurant				Project #: 17443			
6 Washington Avenue Portland, Maine				Sheet: 1 of 1			
Prep by: WMP				Date started: 1/2/2009 Date Comp: 1/2/2009			
Drilling Co: Northern Test Borings				Ground Elevation: 81 ft +/-			
Foreman: M. Nadeau				Reference: Site Plan prepared by Associated Design Partners			
Summit: B. Peterlein, P.E.				Date started: 1/2/2009 Date Comp: 1/2/2009			
DRILLING METHOD		SAMPLER		GROUND WATER DEPTH			
Vehicle: Trailer	Type: 24" SS	Date	Depth	Elevation	Comments		
Model: Deidrich D50	Hammer: 140 lb	1/2/2009	15 ft	66 ft +/-	Wet sample		
Method: 2-1/2" H.S.A.	Fall: 30"						
Depth (ft.)	SAMPLE DATA				ENGINEERING DESCRIPTION	GEOLOGIC DESCRIPTION	
	No.	Pen/Rec (in.)	Depth (ft)	Blows			
1	S-1	24/6	0 to 2	14	2-1/4" Pavement	FILL	
				9	Dark brown Silty SAND, chunks of brick, ashes, loose, dry, SM		
				3			
2				3			
	S-2	24/6	2 to 4	1			
3				1			
4				1			
5							
6	S-3	24/18	5 to 7	2	wood layer		
7				1/2	loose soil?		
8	S-4	24/16	7 to 9	1			
9				5	Brown fine to medium SAND, trace Silt, moist, compact, SP	GLACIAL TILL	
10				6			
11	S-5	24/16	10 to 12	7	Brown SAND, clean, compact, moist, SP		
12				8			
13				8			
14							
15							
16	S-6	24/18	15 to 17	5	Same as S-5, wet		
17				5			
18				6			
19				7			
20							
21	S-7	24/24	20 to 22	7	Brown medium to fine SAND, trace to little Silt, compact, wet, SP	Gravel = 0.0% Sand = 84.0% Silt = 16.0%	
22				9			
23				11			
24				13			
25							
26	S-8	24/24	25 to 27	8	Same as S-7		
27				9			
				11			
				12			
					End of Boring at 27 ft		

<b>SUMMIT GEOENGINEERING SERVICES</b> 640 Main Street Lewiston, Maine 04240				<b>SOIL BORING LOG</b>			Boring #: <b>B-4</b>
Project: Bingas Wingas Restaurant				Project #: 17443			
6 Washington Avenue Portland, Maine				Sheet: 1 of 1			
Prep by: WMP				Date started: 1/2/2009 Date Comp: 1/2/2009			
Drilling Co: Northern Test Borings				Ground Elevation: 81 ft +/-			
Foreman: M. Nadeau				Reference: Site Plan prepared by Associated Design Partners			
Summit: B. Peterlein, P.E.				Date started: 1/2/2009 Date Comp: 1/2/2009			
DRILLING METHOD		SAMPLER		GROUND WATER DEPTH			
Vehicle: Trailer	Type: 24" SS	Date	Depth	Elevation	Comments		
Model: Deidrich D50	Hammer: 140 lb	1/2/2009	16.5 ft	64.5 ft +/-	Wet sample		
Method: 2-1/2" H.S.A.	Fall: 30"						
Depth (ft.)	SAMPLE DATA				ENGINEERING DESCRIPTION	GEOLOGIC DESCRIPTION	
	No.	Pen/Rec (in.)	Depth (ft)	Blows			
1	S-1	24/12	0 to 2	5	Gray to black fine SAND mixed with ashes, brick, glass, compact, SM	FILL	
				6			
				8			
2	S-2	24/12	2 to 4	4	Brown SAND, trace Silt, loose, dry, SP	FILL	
				4			
				4			
3	S-3	24/12	5 to 7	1	Reddish brown SAND, trace to little Gravel, trace Silt, moist, SM	FILL	
				11			
				16			
4	S-4	24/12	7 to 9	11	Brown SAND, clean, compact, moist, SP	GLACIAL TILL	
				13			
				17			
5	S-5	24/20	10 to 12	10	Same as S-4	GLACIAL TILL	
				10			
				14			
6	S-6	24/24	15 to 17	5	Same as S-4	GLACIAL TILL	
				7			
				9			
7	S-7	24/18	20 to 22	1	Same as S-6	GLACIAL TILL	
				4			
				3			
8	S-8	24/24	25 to 27	4	Same as S-6	GLACIAL TILL	
				5			
				6			
9				7	End of Boring at 27 ft		

**APPENDIX C**  
LABORATORY TEST RESULTS

**SUMMIT GEOENGINEERING SERVICES**

434 Cony Road, Augusta, Maine 04330  
Phone:(207) 621-8334 Fax:(207) 626-9094



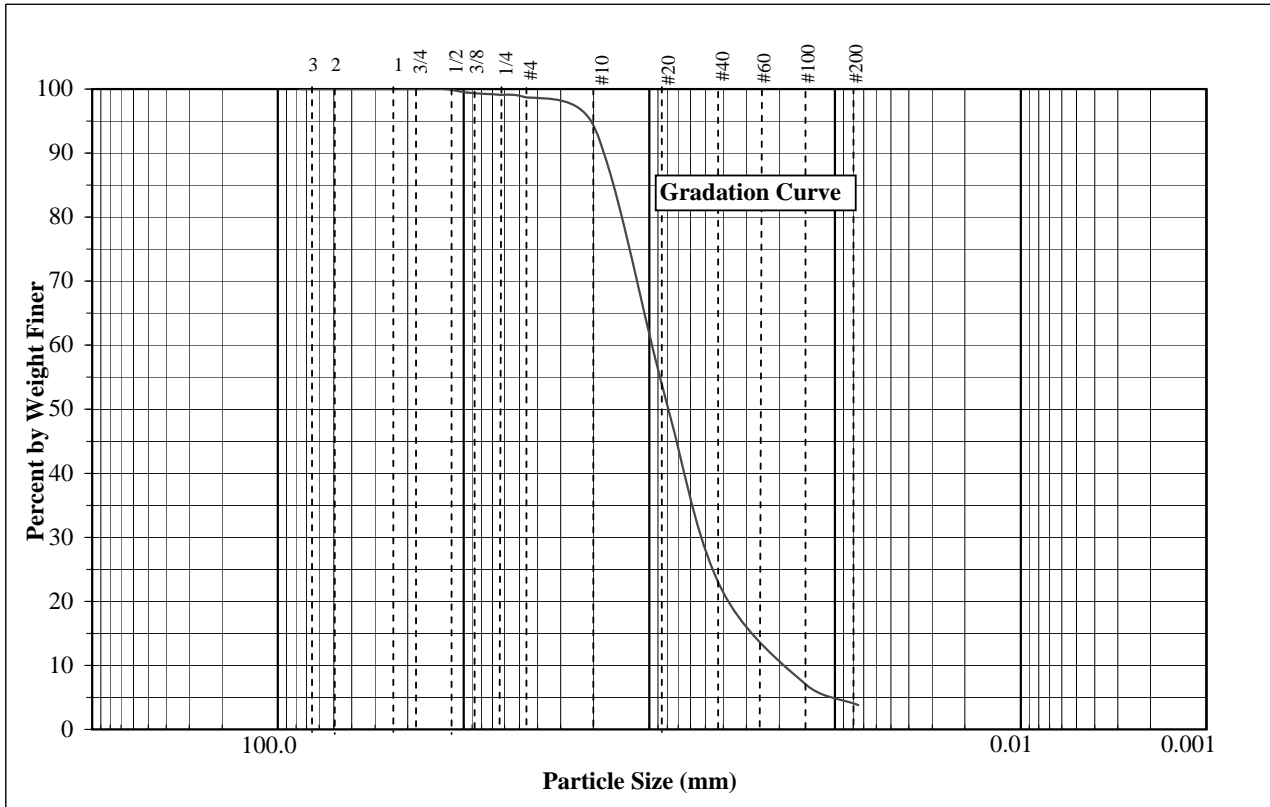
**GRAIN SIZE ANALYSIS - ASTM D422**

PROJECT NAME: Bingas Wingas, Washington Street, Portland  
CLIENT: Bingas Wingas  
SOIL DESCRIP:  
INTENDED USE: Investigation  
SPECIFICATION:

PROJ #: 17449  
SAMPLE: S1  
DATE: 1/6/09  
SOURCE: Boring B-3, 15'-17'  
TECH: F. Clark

**DATA**

<u>PARTICLE SIZE mm</u>	<u>% BY WT FINER</u>
76.20 (3 in)	100.0
50.80 (2 in)	100.0
38.10 (1-1/2 in)	100.0
25.40 (1 in)	100.0
19.05 (3/4 in)	100.0
12.70 (1/2 in)	100.0
9.53 (3/8 in)	99.5
6.35 (1/4 in)	99.1
4.75 (No. 4)	98.8
2.00 (No. 10)	94.4
0.85 (No. 20)	53.5
0.43 (No. 40)	22.9
0.15 (No. 100)	7.5
0.08 (No. 200)	3.8



REMARKS:

Reviewed: Darrell A. Gilman, CMT Manager  
Sent: 1/6/08

**SUMMIT GEOENGINEERING SERVICES**

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Phone:(207) 621-8334 Fax:(207) 626-9094



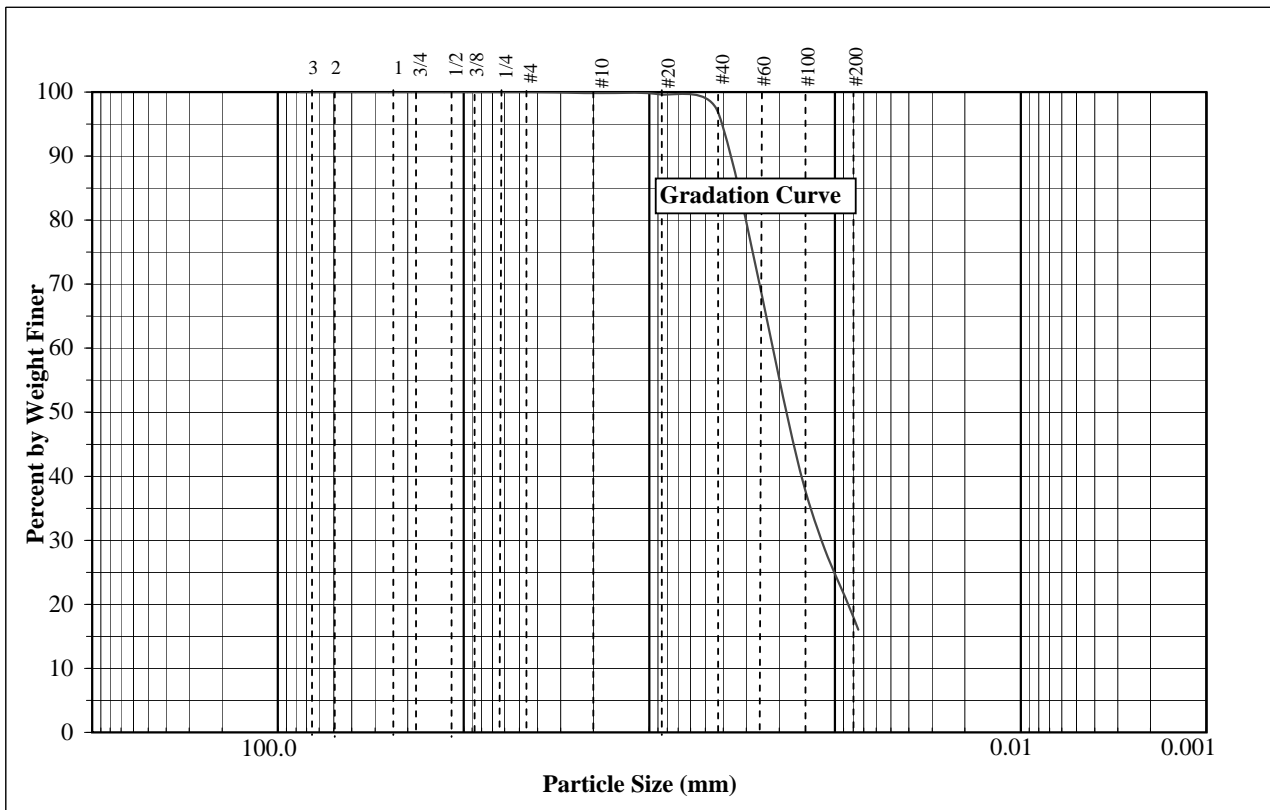
**GRAIN SIZE ANALYSIS - ASTM D422**

PROJECT NAME: Bingas Wingas, Washington St. Portland  
CLIENT: Bingas Wingas  
SOIL DESCRIP:  
INTENDED USE: Investigation  
SPECIFICATION:

PROJ #: 17449  
SAMPLE: S2  
DATE: 1/6/09  
SOURCE: Boring B-3, 20'-22'  
TECH: F. Clark

**DATA**

<u>PARTICLE SIZE mm</u>	<u>% BY WT FINER</u>
76.20 (3 in)	100.0
50.80 (2 in)	100.0
38.10 (1-1/2 in)	100.0
25.40 (1 in)	100.0
19.05 (3/4 in)	100.0
12.70 (1/2 in)	100.0
9.53 (3/8 in)	100.0
6.35 (1/4 in)	100.0
4.75 (No. 4)	100.0
2.00 (No. 10)	99.9
0.85 (No. 20)	99.6
0.43 (No. 40)	96.7
0.15 (No. 100)	39.5
0.08 (No. 200)	16.0



REMARKS:

Reviewed: Darrell A. Gilman, CMT Manager  
Sent: 1/7/08





SECTION 033000 – CAST -IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

- A. Work included: Provide labor, materials, and equipment necessary to complete the work of this Section and, without limiting the generality thereof, furnish and include the following:
  - 1. The extent of cast-in-place concrete work is shown on drawings and includes (but not by way of limitation) formwork, reinforcing, cast-in-place concrete, accessories, finishing, and casting in of items specified under other Sections of the Specifications or furnished by Owner that are required to be built-in with the concrete.
  - 2. Equipment support pads indicated on mechanical drawings to be installed by the Building Contractor.
  - 3. Cast-in-place retaining walls, exterior slabs on grade and other concrete shown on site drawings.

1.03 RELATED WORK:

- A. Metal Fabrications: Section 055000.
  - 1. Expansion Anchors - Section 051200.
  - 2. Embedded Items - Section 055000.
- B. Anchor Bolts: Section 051200.
- C. Joint Sealants: Section Division 07.
- D. Underslab Vapor Retarders/Wall Waterproofing: Division 07.

1.04 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with provisions of the latest edition of the following except where more stringent requirements are shown or specified:

## 221 CONGRESS STREET

1. ACI "Manual of Concrete Practice".
2. ACI 117 "Standard Specifications for Tolerances for Concrete Construction and Materials".
3. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."
4. ACI 212.3R "Chemical Admixtures for Concrete."
5. ACI 301 "Specifications for Structural Concrete for Buildings."
6. ACI 302.1R "Guide for Concrete Floor and Slab Construction."
7. ACI 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete."
8. ACI 304.2R "Placing Concrete by Pumping Methods."
9. ACI 306 R "Cold Weather Concreting."
10. ACI 308 "Standard Practice for Curing Concrete."
11. ACI 309R "Guide for Consolidation of Concrete."
12. ACI 315 "ACI Detailing Manual."
13. ACI 318 "Building Code Requirements for Reinforced Concrete."
14. ACI 347R "Guide to Formwork for Concrete."
15. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars."
16. AISC "Code of Standard Practice for Steel Buildings and Bridges."
17. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

### 1.05 SUBMITTALS:

- A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with Division 1.
- B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

- C. All submittals shall be reviewed and returned to the Architect within 10 working days.
- D. Incomplete submittals will not be reviewed.
- E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with.
- F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.
- G. Hardcopy Submittals: Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.
- H. Electronic Submittals:
  - 1. Contractor shall include in the submittal schedule an indication of submittals that are intended to be submitted electronically. Upon receipt of the submittal schedule, the Engineer reserves the right to indicate submittals that will not be accepted electronically. Paper copies of such submittals shall be furnished as referenced in this specification.
  - 2. The Engineer reserves the right to require paper copies of submittals that are received electronically. Provide Engineer one (1) paper copies in addition to the electronic submittal. Paper copy will be retained and electronic copy will be returned. Review cycle for such submittals shall not commence until such time that the paper copies are received.
  - 3. Electronic Submittals shall be submitted in Protected Document Format (PDF) compatible with Bluebeam version 12 or later. Electronic files shall not be broken into smaller individual files. File sizes too large to process email or within a file transfer protocol (FTP) site shall be provided on a CD.
  - 4. The submission of submittals electronically does not relieve the contractor of their responsibility to review the submittal prior to transmission to the Engineer. Electronic Submittals shall include contractor comments, and a statement and/or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with. Electronic submittals without the Contractor's approval will be rejected and returned.
  - 5. The Engineer assumes no responsibility for the printed reproduction of submittals reviewed electronically, transmission errors or returned electronic submittals that become corrupted or are otherwise not accessible by the Contractor's or Subcontractor's computer hardware and/or software.

- I. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. Reinforcement certified mill reports covering chemical and physical properties and yield strength.
  2. Patching products.
  3. Non-shrink grout.
  4. Curing compounds, where applicable.
  5. Admixtures.
  6. Expansion/Adhesive Anchors.
- J. Shop Drawings:
1. Shop Drawing Preparation: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings is prohibited. Shop drawings created from reproduced Construction Documents will be returned without review. Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315, showing bar schedules, stirrup and tie spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete elements. Include supplemental reinforcing and bar supports necessary to support reinforcing steel at proper location within forms or slabs.
    - a. Review of the shop drawings will be made for the size and arrangement of reinforcement. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility.
    - b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided all items listed prior. **Incomplete submittals will not be reviewed.**
- K. Mix designs: Submit all laboratory test reports and materials for each mix design listed within. Prepare mixes by the field experience method and/or trial mixtures per the requirements of chapter 5 of ACI 318. Include the calculation of average strength and standard deviation. Proportioning by water cement ratio method will not be permitted.
- L. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.
- M. Curing Methods: Submit documentation of curing methods to be used for review. Account for anticipated project temperature ranges and conditions in curing methods.

## 221 CONGRESS STREET

- N. Contraction/Construction Joints: Submit plan indicating proposed location of contraction and construction joints in walls and slabs.
- O. Test Reports: Test reports shall be submitted to the Owner, Architect and Engineer within 48 hour after completion of each test.

## PART 2 - PRODUCTS

### 2.01 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
  - 1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

### 2.02 REINFORCING MATERIALS:

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Provide welded wire fabric in flat sheets.
- C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use plastic, wire bar type supports or concrete block supports complying with CRSI recommendations, unless otherwise specified. Wood, clay brick and other unspecified devices are not acceptable.
  - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS:

- A. Single-Source Supplier: Ready-mix concrete shall be from one supplier unless specific written approval is received from the Structural Engineer.
- B. Portland Cement: ASTM C 150, Type I or Type II, unless otherwise approved Use one brand of cement throughout project, unless otherwise acceptable to Architect.
- C. Normal Weight Aggregates: ASTM C 33. Provide from a single source for exposed concrete. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, or ochre which can cause stains on exposed concrete surfaces.
- D. Light Weight Aggregates: ASTM C 330.
- E. Water: Potable.
- F. Air-Entraining Admixture: ASTM C 260.
- G. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G containing not more than 1% chloride ions.
- H. Fiber reinforcement shall be Type III Synthetic Virgin Homopolymer Polypropylene Fibers conforming to ASTM C1116. Fiber reinforcing shall be added and distributed prior to incorporation of Super Plasticizer.
- I. Normal range water reducing admixture: ASTM C 494 Type A containing no calcium chloride.
- J. Accelerating Admixture: ASTM C 494, Type C or E.
- K. Air Detraining Admixture: ASTM C494, Type S, Specific Performance Admixture
- L. Blast Furnace Slag: ASTM C989
- M. Fly Ash: ASTM C618, Class C or F
- N. Calcium Chloride is not permitted.

2.04 RELATED MATERIALS:

- A. Underslab Vapor Retarder: Provide vapor retarder over prepared sub base. Refer to architectural drawings, geotechnical report and/or division 07 specifications for additional requirements and vapor retarder location.
- B. Non-Shrink Cement-based Grout: Provide grout consisting of pre-measured, prepackaged materials supplied by the manufacturer requiring only the addition of water. Manufacturer's instructions must be printed on the outside of each bag.

1. Non-shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maximum of 0.3% expansion in the hardened state when tested in accordance with CRD-C-621.
  2. Compressive strength: A minimum 28 day compressive strength of 5000 psi when tested in accordance with ASTM C-109.
  3. Setting time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.
  4. Composition: Shall not contain metallic particles or expansive cement.
- C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.
- D. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.
1. Waterproof paper.
  2. Polyethylene film.
  3. Polyethylene-coated burlap.
- E. Liquid Membrane-Forming Curing Compound: Liquid type membrane forming curing compound complying with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Curing compound shall not impair bonding of any material, including floor finishes, to be applied directly to the concrete. Demonstrate the non-impairment prior to use.
- F. Preformed Expansion Joint Formers:
1. Bituminous Fiber Type, ASTM D 1751.
  2. Felt Void, Poly-Styrene Cap with removable top as manufactured by SUPERIOR.
- G. Slab Joint Filler: Multi-component polyurethane sealant (self-leveling type).
- H. Waterstops shall be a polyvinylchloride (PVC) flat ribbed product. Acceptable products include:
1. "Greenstreak PVC Waterstop," by Sika Corporation.
  2. "PVC Waterstop," by W.R. Meadows

2.05 PROPORTIONING AND DESIGN OF MIXES:

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 318. Use material, including all admixtures, proposed for use on the project. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.
- B. Submit written reports to Architect of each proposed mix for each class of concrete. Do not begin concrete production until mixes have been reviewed by Architect.
- C. Proportion design mixes to provide concrete with the following properties:
  - 1. Footings and foundation walls
    - a. Strength: 3,500 psi at 28 days.
    - b. Aggregate: 3/4"
    - c. Design Air Dry Density: 145 pcf Normal Weight
    - d. W/C Ratio: 0.55 maximum
    - e. Entrained Air: 6% +/- 1.5%
    - f. Slump: 4" maximum
  - 2. Interior Slabs on grade and elevated slabs:
    - a. Strength: 3,000 psi at 28 days
    - b. Aggregate: 3/4" minimum, 1 1/2" maximum
    - c. Design Air Dry Density: 145 pcf Normal Weight
    - d. W/C Ratio: 0.54 maximum
    - e. Entrapped Air only (no entrainment), not to exceed 3% at point of discharge
    - f. Slump: 4" maximum
  - 3. Exterior Slabs and all other exposed Site Concrete not specified elsewhere:
    - a. Strength: 5,000 psi at 28 days
    - b. Aggregate: 3/4"



- c. Design Air Dry Density: 145 pcf Normal Weight
  - d. W/C Ratio: 0.40 maximum
  - e. Entrained Air: 6% +/- 1.5%
  - f. Slump: 4" maximum
- 4. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.
  - 5. Additional slump may be achieved by the addition of a mid-range or high-range water reducing admixture. Maximum slump after the addition of admixture shall be 6 or 8 inches for mid-range or high range water reducing admixtures, respectively.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor, when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Structural Engineer before using in work.
- 1. Water may be added at the project only if the maximum specified slump and design mix maximum water/cement ratio is not exceeded.
  - 2. Additional dosages of superplasticizer should be used when delays occur and required slump has not been maintained. A maximum of two additional dosages will be permitted per ACI 212.3R recommendations.

2.06 CONCRETE MIXING:

- A. Job-Site Mixing will not be permitted.
- B. Ready-Mix Concrete: Must comply with the requirements of ASTM C 94, and as herein specified. Provide batch ticket for each batch discharged and used in work, indicating project name, mix type, mix time and quantity.
  - 1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required by Structural Engineer.
  - 2. When the air temperature is between 85 degrees F. and 90 degrees F., reduce the mixing and delivery time from 1 1/2 hours to 75 minutes, and when the air temperature is above 90 degrees F., reduce the mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMS:

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design, construct, erect, maintain, and remove forms for cast-in-place concrete work in compliance with ACI 347.
- C. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- D. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- E. Vertical dovetail slots may be required for masonry tie installation. Coordinate dovetail slot spacing and location with division 4 specifications and Architectural drawings.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, dovetail slots, reglets, recesses, and the like to prevent swelling and for easy removal.
- G. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- H. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- I. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
  - 1. Unless otherwise indicated, provide ties for concrete surfaces to be exposed to view in the final condition so portion remaining within concrete after removal is 1" (minimum) inside concrete.

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2. Form ties shall not leave holes larger than 1" diameter in concrete surface. Repair holes left by form ties after removal of formwork.
- J. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- K. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

### 3.02 PLACING REINFORCEMENT:

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
  1. Subgrade tolerance shall conform to a tolerance of  $\pm 1\frac{1}{2}$ ". Base tolerance (fine grading) for slabs shall conform to a tolerance of  $\pm 3/4$ " in. Confirm compliance of above tolerances with surveyed measurements taken at 20 ft. intervals in each direction.
  2. Concrete reinforcing and/or welded wire fabric shown on structural drawings is provided for structural purposes only; additional reinforcement may be necessary for reinforcing support, the anchorage of structural embedded items, and the anchorage of non-structural embedded items including but not by limitation radiant tubing. This reinforcing is not shown on the structural drawings as it is part of the contractor's means and methods and shall be included at no cost to the Owner.
  3. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
  4. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
  5. Place reinforcement to obtain specified coverage for concrete protection within tolerances of ACI-318. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
  6. Install welded wire fabric in flat sheets in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS:

- A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect. Submit plan indicating proposed location of construction joints for review prior to beginning work.
1. Provide keyways at least 1-1/2" deep in construction joints in walls, and slabs; bulkheads reviewed by the Engineer, designed for this purpose may be used for slabs.
  2. Roughened surfaces shall be used between walls and footings unless shown otherwise on the drawings. The footing surface shall be roughened to at least an amplitude of 1/4" for the width of the wall before placing the wall concrete.
  3. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
  4. Joints in slabs on grade shall be located and detailed as indicated on the drawings. If saw-cut joints are required, the early-entry dry-cut process shall be used. Refer to ACI 302, section 8.3.12.

3.04 INSTALLATION OF EMBEDDED ITEMS:

- A. General: Set, securely anchor and build into work prior to concrete placement all anchorage devices and all other embedded items, including but not by limitation reinforcement, reinforcing dowels, embedded plates, anchor rods, anchor inserts, sleeves, load transfer plates, diamond dowels and shelf bulk heads required for other work that is attached to, bear upon, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Notify other trades to permit installation of their work. Templates to be utilized for setting of anchorage devices shall be constructed in a manner to allow mechanical consolidation of concrete without disturbance. Embedments shall be placed in a timely fashion to permit the inspection of embedments prior to concrete placement. **“Wet Setting” of embedded items into plastic concrete is strictly prohibited.**
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.
- C. Provide PVC sleeves where pipes and/or conduit pass through exterior concrete or slabs. Sleeves or penetrations shall not be placed through footings, piers, pedestals, drop caps, columns or pilasters unless specifically noted.
- D. Tolerances: Tolerances for Anchor Bolts/Rods, other embedded items and bearing surfaces shall meet the requirement set forth in the latest edition of the American Institute of Steel Construction “Code of Standard Practice for Steel Buildings and Bridges,” and ACI 117. The more stringent criteria from these documents shall apply.

3.05 INSTALLATION OF GROUT

- A. Place grout for base plates in accordance with manufacturer's recommendations.
- B. Grout below setting plates as soon as practicable to facilitate erection of steel and prior to removal of temporary bracing and guys. If leveling bolts or shims are used for erection grout shall be installed prior to addition of any column load.
- C. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

3.06 PREPARATION OF FORM SURFACES:

- A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating material manufacturer's directions. Do not allow excess form coating to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.07 CONCRETE PLACEMENT:

- A. Preplacement Review: Footing bottoms are subject to review by the Geotechnical Engineer. Reinforcement and all concrete preparation work shall be subject to review by the Structural Engineer. Verify that reinforcing, ducts, anchors, seats, plates and other items cast into concrete are placed and securely held. Notify Engineer/Project Special Inspector 48 hours prior to scheduled placement and obtain approval or waiver of review prior to placement. Be sure that all debris and foreign matter is removed from forms.
- B. Concrete shall be placed in the presence of an approved testing agency.
- C. General: Comply with ACI 304, and as herein specified.
  - 1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.
  - 2. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

3. Conveying equipment shall be approved and shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:
    - a. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.
    - b. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long, and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.
    - c. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete.
    - d. Concrete shall not be conveyed through pipe made of aluminum alloy. Standby equipment shall be provided on the site.
    - e. Tined rakes are prohibited as a means of conveying fiber reinforced concrete.
  4. Do not use reinforcement as bases for runways for concrete conveying equipment or other construction loads.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Consolidate placed concrete by mechanical vibrating equipment. Hand-spading, rodding or tamping as the sole means for the consolidation of concrete will only be permitted with special permission from the Engineer. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

2. Use vibrators designed to operate with vibratory equipment submerged in concrete, maintaining a speed of not less than 8000 impulses per minute and of sufficient amplitude to consolidate the concrete effectively. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine, generally at points 18 inches maximum apart. Place vibrators to rapidly penetrate placed layer and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion maintain the duration of vibration for the time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operation.
- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
1. Consolidate concrete using internal vibrators during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on plastic surface.
  3. Maintain reinforcing in proper position during concrete placement operations.
  4. Slab thicknesses indicated on the drawings are minimums. Provide sufficient concrete to account for structure deflection, subgrade fluctuations, and to obtain the specified slab elevation at the flatness and levelness indicated here within.
  5. Finish: See “Monolithic Slab Finishes” in this specification for slab finish requirements.
- F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F (27degrees C) at point of placement.
  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 and other materials containing antifreeze agents or chemical accelerators.

4. All temporary heat, form insulation, insulated blankets, coverings, hay or other equipment and materials necessary to protect the concrete work from physical damage caused by frost, freezing action, or low temperature shall be provided prior to start of placing operations.
  5. When the air temperature has fallen to or is expected to fall below 40 degrees F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 degrees F.
- G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.
  2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
  3. Wet forms thoroughly before placing concrete.
  4. Do not use retarding admixtures without the written acceptance by the Architect.

### 3.08 FINISH OF FORMED SURFACES:

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This concrete surface shall have texture imparted by form facing material, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 in. in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This as-cast concrete surface shall be obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment. Combine one part Portland cement to 1-1/2 parts fine sand by volume and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.



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1. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- D. Related Unformed Surfaces: At tops of walls and grade beams, horizontal offset surfaces occurring adjacent to formed surfaces, strike-off, smooth and finish with a texture matching adjacent unformed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.09 FLOOR FLATNESS AND LEVELNESS

- A. Floor flatness/levelness tolerances: Tolerances for various floor uses shall conform to the requirements set forth in ACI 117 and ACI 302 for “flat” floor profile.
  1. Minimum Test Area Flatness/Levelness:  $F_F35/F_L25$
  2. Minimum Local F Number:  $F_F25/F_L15$
- B. Levelness criteria shall be applied to slabs-on-grade only.
- C. Contractor shall measure floor finish within 72 hours after slab finishing and provide corrective measures for finishes not within tolerance. Corrective procedures shall be reviewed by the Architect prior to implementation.

### 3.10 MONOLITHIC SLAB FINISHES:

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds, and as otherwise indicated.
  1. After placing slabs, plane surface to a tolerance not exceeding 1/2 in. in 10 ft. when tested with a 10-ft. straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, and as otherwise indicated.
- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces indicated, including slab surfaces to be covered with carpet, resilient flooring, paint or other thin-film finish coating system.
- D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
- E. Slab finishes for floor coverings not indicated or exposed to view in the final condition shall be coordinated with the Architect prior to slab placement.
- F. Slab Joints: Where indicated, sawn slab contraction joints shall be “soft cut”, immediately after concrete surface is firm enough not to be torn or damaged by the blade.

3.11 CONCRETE CURING AND PROTECTION:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 308 as herein specified.
- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified unless noted otherwise. Curing shall commence as soon as concrete surfaces are sufficiently hard as to withstand surface damage.
- C. Curing of Slabs-on Grade:
  - 1. Slabs-on-grade shall be cured by wet curing methods unless otherwise noted.
  - 2. Slabs-on-grade to receive floor coverings with moisture sensitive adhesives shall be cured by means of a moisture retaining covering. Coordinate curing with flooring adhesive manufacturer and flooring installer. Submit curing methods to Architect for review and approval.
  - 3. Slab-on Grade with Barrier 1 Admixture shall be cured by means of a moisture retaining covering in accordance with recommendations of Barrier 1 Admixture Manufacturer.
- D. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- E. Protection From Mechanical Injury: During the curing period and duration of construction, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

3.12 REMOVAL OF FORMS:

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

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- B. Formwork supporting weight of concrete, such as joints, slabs and other structural elements, may not be removed in fewer than 14 days or until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and support.

### 3.13 REUSE OF FORMS:

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and latency, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

### 3.14 MISCELLANEOUS CONCRETE ITEMS:

- A. Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

### 3.15 CONCRETE SURFACE REPAIRS:

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Architect.
  - 1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with approved bonding agent. Place patching mortar after bonding compound has dried.
  - 2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, form tie holes, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, and other projections on surface and stains and other discolorations that cannot be removed by cleaning.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION:

- A. Testing Agency/Project Special Inspector shall verify reinforcement, including foundation reinforcement and slab reinforcement (WWF or reinforcing bar). Agent shall verify WWF or reinforcement has been chair/placed with proper clearances.
- B. The Owner shall employ a Testing Laboratory to inspect, sample and test the materials and the production of concrete and to submit test reports. Concrete testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board and/or ACI Concrete Field Testing Technician Grade I.
- C. Concrete shall be sampled and tested for quality control during placement. Quality control testing shall include the following, unless otherwise directed by the Architect.
- D. See Submittals section for report requirements.
- E. Sampling Fresh Concrete: ASTM C 172.
  - 1. Slump: ASTM C143; One test for each set of compressive strength test specimens. Sample shall be taken from middle third of the load per ASTM C172. A slump test must be run prior to the incorporation of the CFP fibers per recommendations of ACI 544. A slump test must be run prior to and following the addition of a water reducer (superplasticizer) per recommendations of ACI 301.
  - 2. Air Content: ASTM C231 "Pressure method for normal weight concrete." One test for each set of compressive strength specimens measured at point of discharge.
  - 3. Concrete Temperature: Per ASTM C-1064; One test each time a set of compression test specimens are made.
  - 4. Compression Test Specimen: ASTM C31; one set of 5 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
    - a. An insulated Cure Box for specimen curing shall be supplied by Testing Agency for initial curing as defined in ACI C31.
    - b. Means of heating or cooling the Cure Box shall be provided by the Inspection Agency if required in order to maintain a temperature between 60 and 80 degrees F. Contractor shall provide an electrical source to the Testing Agency when required for temperature control.

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- c. A maximum-minimum thermometer shall be provided in the Cure Box by the Testing Agency to record the temperature range of the Cure Box during specimen curing. The Testing Agency shall record the maximum/minimum temperature of the Cure Box when transferring the specimens to the laboratory.
  - d. Test Specimens shall be moist cured.
  - e. Refer to ASTM C31 for additional requirements for Test Specimens.
5. Compressive Strength Tests: ASTM C39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 4,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 3 specimens tested at 28 days, 1 specimen retained in reserve for later testing if required.
6. Pumped concrete shall be tested at point of discharge per ACI 301.
- F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods, as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION 033000



SECTION 033536 - SPECIAL CONCRETE FLOOR FINISHES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the following:

1. Applying Sealer and Hardener, and polishing concrete to specified finish level.

1.2 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

1. Submit special concrete finishes manufacturer's specifications and test data.
2. Submit special concrete finishes describing product to be provided, giving manufacturer's name and product name for the specified material proposed to be provided under this section.
3. Submit special concrete finishes manufacturer's recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
4. Submit special concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.
5. Submit special concrete finishes manufacturer's Material Safety Data Sheet (MSDS) and other safety requirements.
6. Follow all special concrete finishes published manufacturer's installation instructions.

B. Test Reports:

1. Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.

C. LEED Submittal:

1. Product Data for Credit EQ 4.1: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. Use a Certi-Shine Certified Applicator, Certi-Shine Tooling and an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
2. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section.

B. Manufacturer's Certification:

1. Provide letter of certification from concrete finish manufacturer stating that installer is certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer.

C. Mock-ups:

1. Apply mock-ups of each type finish, to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship.
  - a. Build mock-ups approximately 50 square feet in the location indicated or if not indicated, as directed by the Architect.
  - b. Notify Architect seven days in advance of dates and times when mock-ups will be constructed.
  - c. Obtain from the Architect's approval of mock-ups before starting construction.
  - d. If the Architect determines that mock-ups do not meet requirements, demolish and remove them from the site and cast others until mock-ups are approved.
  - e. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
  - f. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.

D. Protection

1. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
  - a. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
  - b. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
  - c. No pipe cutting machine will be used on the inside floor slab.
  - d. Steel will not be placed on interior slab to avoid rust staining.

E. Pre-Installation Conference:

1. Conduct conference at project site to comply with requirements in Division 01 Section "Project Management and Coordination"
2. Architect, General Contractor, Certified Installer shall conduct a Certi-Shine Project Conference and Job Survey form to be completed and submitted to all attendees.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original containers, with seal's unbroken, bearing manufacturer labels indicating brand name and directions for storage.
- B. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.5 PROJECT CONDITIONS



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- A. Environmental limitations:
  - 1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
    - a. Concrete must be cured a minimum of 45 days or as directed by the manufacturer before application of Retro Plate can begin.
    - b. Application of Retro-Plate shall take place 10 days prior to installation of equipment and substantial completion, thus providing a complete, uninhibited concrete slab for application.
- B. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.

### 1.6 WARRANTY

- A. Certi-Shine Colored: Provide 10 year manufacturer's material warranty commencing at date of building substantial completion. Manufacturer shall warrant to the owner that polished surface will remain water repellent, dustproof, hardened, abrasion and food stain resistant.

## PART 2 - PRODUCTS

### 2.1 APPROVED APPLICATORS

- A. DMT Incorporated, 25 Dumais Avenue, Lewiston, ME. 800-367-7566.
- B. Industrial Concrete Services (ICS), Gorham, ME 877-8565400.

### 2.2 MATERIALS AND MANUFACTURERS

- A. Materials: Special Concrete finish: Silicate sealer, hardener, densifier floor finish. Subject to compliance with project requirements, provide special concrete finish as manufactured by the following: (by Vexcon Chemicals Inc. (888) 839-2661 or fax (215) 332-9997 contact Darryl Manuel, President).
- B. Proprietary Product: Provide only Certi-Shine Stain.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.

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- B. Verify that base slab meet finish and surface profile requirements in Division 03 Section “Cast-In-Place Concrete,” and Project Conditions above.
- C. Prior to application, verify that floor surfaces are free of construction latents.

### 3.2 PREPARATION

- A. Power sweep floor area, blow-out corners and column footings. Use sweeping compound to control airborne dust.
- B. Thoroughly clean the concrete surface, removing all coatings, dirt, oil and laitance with Certi-Vex Concrete Stripper
- C. Treat oil spots with oil emulsifier and oil absorber materials. Detail scrub with high pH detergent.
- D. Wet soak floor with water for minimum of 30 minutes.
- E. Double scrub floor with automatic scrubber capable minimum of 80 to 120 pounds of head pressure, equipped with black stripping pads. Use proper dilution of high pH detergent. Scrub floor once without squeegee or vacuum. On second pass, remove water solution.
- F. Power rinse surface removing all traces of soap residue.
- G. Inspect the concrete surface
- H. Complete surface preparation per manufacturers written instructions.

### 3.3 APPLICATION

- A. Immediately following cleaning operation apply special concrete finish material per manufacturer’s instructions.
- B. Perform polishing operation to a Certi-Shine Silver - Satin Shine polish level.
- C. Joints that require the application of Joint Sealant, shall be primed with Powercoat Primer, and filled with Powercoat
- D. Flexible Epoxy Joint Sealant, after the application and polishing of the Certi-Shine system.
- E. Joint repair to be performed by Certi-Shine certified installer.

### 3.4 PROTECTION:

- A. Protect finished work until fully cured in accordance with manufacturer’s recommendations.

END OF SECTION 033536

SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulated, architectural precast concrete cladding units.

1.2 DEFINITIONS

- A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

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

- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings:

1. Detail fabrication and installation of architectural precast concrete units.
2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate details at building corners.
5. Indicate separate face and backup mixture locations and thicknesses.
6. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
8. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
9. Include plans and elevations showing unit location and sequence of erection for special conditions.
10. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
11. Indicate relationship of architectural precast concrete units to adjacent materials.
12. Indicate locations, dimensions, and details of thin-brick units, including corner units and special shapes, and joint treatment.
13. Indicate locations, dimensions, and details of stone facings, anchors, and joint widths.

14. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
- D. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
  1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
  2. Samples for each thin-brick unit required, showing full range of color and texture expected. Include Sample showing color and texture of joint treatment.
    - a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
    - b. Grout Samples for Verification: Showing color and texture of joint treatment.
- E. Delegated-Design Submittal: For architectural precast 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.
  1. Show governing panel types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Material Certificates: For the following items:
  1. Cementitious materials.
  2. Reinforcing materials and prestressing tendons.
  3. Admixtures.
  4. Bearing pads.
  5. Structural-steel shapes and hollow structural sections.
  6. Stone anchors.
  7. Insulation.
- C. Material Test Reports: For aggregates.

## 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes

preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as an APA-certified plant for production of architectural precast concrete products.
- B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1077 and ASTM E 329 for testing 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 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
- E. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels approximately 4 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
  1. Locate panels where indicated or, if not indicated, as directed by Architect.
  2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
  3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.

#### 1.7 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.
- B. Support units during shipment on nonstaining shock-absorbing material.
- C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- D. Place stored units so identification marks are clearly visible, and units can be inspected.
- E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

- F. Lift and support units only at designated points indicated on Shop Drawings.

## PART 2 - PRODUCTS

### 2.1 APPROVED FABRICATORS

- A. Northern Design Precast.
- B. Product: Thinshell Panels, 2-1/4 inch precast face with insulated precast backup wall.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design architectural precast concrete units.
- B. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.
- C. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
  - 1. Loads: As indicated on the structural drawings.
  - 2. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.

### 2.3 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
  - 1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.
- B. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

### 2.4 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

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- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- D. 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 117.

### 2.5 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A 416/A 416M, Grade 270, uncoated, seven-wire, low-relaxation strand.
  - 1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.7 and sheath with polypropylene tendon sheathing complying with ACI 423.7. Include anchorage devices and coupler assemblies.

### 2.6 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.
  - 1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.
- B. Supplementary Cementitious Materials:
  - 1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
  - 2. Metakaolin: ASTM C 618, Class N.
  - 3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33/C 33M, 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. Coloring Admixture: ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.
- E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. 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.
  - 1. Water-Reducing Admixtures: 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. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.

5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing Admixture: ASTM C 1017/C 1017M, Type I.
8. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
9. Corrosion Inhibiting Admixture: ASTM C 1582/C 1582M.

## 2.7 STAINLESS-STEEL CONNECTION MATERIALS

- A. Stainless-Steel Plate: ASTM A 666, Type 304, Type 316, or Type 201.
- B. Stainless-Steel Bolts and Studs: ASTM F 593, Alloy Group 1 or 2 hex-head bolts and studs; ASTM F 594, Alloy Group 1 or 2 stainless-steel nuts; and flat, stainless-steel washers.
  1. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.
- C. Stainless-Steel-Headed Studs: ASTM A 276, Alloy 304 or Alloy 316, with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

## 2.8 BEARING PADS

- A. Provide one of the following bearing pads for architectural precast concrete units as recommended by precast fabricator for application:
  1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, Type A durometer hardness of 50 to 70, ASTM D 2240, minimum tensile strength 2250 psi, ASTM D 412.
  2. Random-Oriented-Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Type A durometer hardness of 70 to 90, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.
  3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; Type A durometer hardness of 80 to 100, ASTM D 2240; complying with AASHTO's "AASHTO LRFD Bridge Design Specifications," Division II, Section 18.10.2; or with MIL-C-882E.
  4. Frictionless Pads: PTFE, glass-fiber reinforced, bonded to stainless or mild-steel plate, or random-oriented-fiber-reinforced elastomeric pads; of type required for in-service stress.
  5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

## 2.9 ACCESSORIES

- A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install architectural precast concrete units.



2.10 GROUT MATERIALS

- A. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

2.11 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
  - 1. Use a single design mixture for units with more than one major face or edge exposed.
  - 2. Where only one face of unit is exposed use either a single design mixture or separate mixtures for face and backup.
- B. Limit use of fly ash and ground granulated blast-furnace slag to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.
- C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.
- D. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.
- E. Normal-Weight Concrete Mixtures: Proportion full-depth mixture 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.
- F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.
- G. 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 117.
- H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.12 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
- B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
  1. Form joints are not permitted on faces exposed to view in the finished work.
  2. Edge and Corner Treatment: Uniformly [**chamfered**] [**radiused**].

## 2.13 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 architectural precast concrete units to supporting and adjacent construction.
- C. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
  1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
  2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
  3. Place reinforcing steel and prestressing strands to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
  4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- D. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- E. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

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- F. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.
- G. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
  - 1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- H. 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 voids on surfaces. Use equipment and procedures complying with PCI MNL 117.
  - 1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.
- I. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.
- J. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.
- K. Cure concrete, according to requirements in PCI MNL 117, 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.
- L. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

### 2.14 FABRICATION TOLERANCES

- A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

### 2.15 FINISHES

- A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved sample panels and as follows:
  - 1. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
- B. Finish exposed top surfaces of architectural precast concrete units to match face-surface finish.

- C. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

## 2.16 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, ASTM C 1610/C 1610M, ASTM C 1611/C 1611M, ASTM C 1621/C 1621M, and ASTM C 1712.
- B. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- C. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.
- B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.
  - 1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
  - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
  4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.
- C. Connect architectural precast 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.
1. Do not permit connections to disrupt continuity of roof flashing.
- D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
  2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
  3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780/A 780M.
  4. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
  5. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.
- E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
  2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:
    - a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
    - b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
    - c. Twist-off Tension Control Bolt: ASTM F 1852.
    - d. Direct-Tension Control Bolt: ASTM F 1852.
  3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.
- F. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

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### 3.3 ERECTION TOLERANCES

- A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

### 3.4 REPAIRS

- A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.
- 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/A 780M.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

### 3.5 CLEANING

- A. Clean surfaces of precast concrete units exposed to view.
- B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- C. 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 recommendations. 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 034500

SECTION 035413 - GYPSUM CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes gypsum-cement-based, self-leveling underlayment for application below interior floor coverings.

1.2 ALLOWANCES

- A. Furnish gypsum-cement-based underlayment as part of underlayment allowance.
- B. Furnish and install gypsum-cement-based underlayment as part of underlayment allowance.

1.3 UNIT PRICES

- A. Work of this Section is affected by underlayment unit price.

1.4 ACTION 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.
- C. Minutes of preinstallation conference.

1.6 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.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

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

#### 1.8 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.

#### 1.9 COORDINATION

- A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, 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 and that can be feathered at edges to match adjacent floor elevations.
  - 1. Products: Subject to compliance with requirements, provide the following or approved equal:
    - a. Maxxon Corporation; Gyp-Crete 2000.
  - 2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.



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3. Compressive Strength: Not less than 2000 psi 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; 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.
- 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.
1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.
  2. Primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.2 ACCESSORIES

- A. Sound Mat:
1. Products: Subject to compliance with requirements, provide the following or approved equal:
    - a. USG; SRM-25 Ready Seam 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. 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.
- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.
- D. 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 035413

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Face brick.
3. Stone trim units.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Cavity-wall insulation.

B. Related Sections:

1. Section 051200 "Steel Framing" for furnishing steel shelf angles for unit masonry.
2. Section 055000 "Metal Fabrications" for furnishing steel lintels for unit masonry.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 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. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
3. 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.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Face brick, in the form of straps of five or more bricks.
2. Stone trim.

3. Colored mortar.
4. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:

1. Face brick, in the form of straps of five or more bricks.
2. Special brick shapes.
3. Stone trim.
4. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
5. Weep holes and vents.
6. Accessories embedded in masonry.

1.4 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. Material Certificates: For each type and size of the following:

1. Masonry units.
  - a. Include data on material properties or material test reports substantiating compliance with requirements.
  - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
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.

C. 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.

- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 year experience.
- B. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- C. Mockups: Build mockups as part of Integrated Exterior Mockup 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 for Mockup.
    - a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
    - b. Include window opening in 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).
    - d. Include metal studs, sheathing, sheathing joint-and-penetration treatment air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
    - e. Notify Architect when backup wall and window installation is complete and prior to installation of brick masonry. Notify Architect again when brick veneer is complete.
  - 2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
  - 3. Clean exposed faces of mockups with masonry cleaner as indicated.
  - 4. Protect accepted mockups from the elements with weather-resistant membrane.
  - 5. 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.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1. At least 7 days prior to starting CMU masonry, conduct a meeting to review detailed requirements for mortar and grout mixes and to determine procedures for satisfactory construction and curing operations. Review requirements of submittals, status of coordinating work, and availability of materials. Review requirements tenting and heating. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with masonry construction to attend, include Contractor's superintendent, masonry foreman and Architect.
  - a. Review sample panel.
  - b. Review tooling requirements for masonry receiving air/vapor barrier membrane.
  - c. Review procedures and installation requirements of flexible flashings.
  - d. Review, installation, handling and protection of architectural precast units from chipping and discoloration.
  
2. At least 7 days prior to starting veneer masonry, conduct a meeting to review detailed requirements for mortar mixes and to determine procedures for satisfactory construction operations. Review requirements of submittals, status of coordinating work, and availability of materials. Review requirements tenting and heating. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with masonry construction to attend, include Contractor's superintendent, masonry foreman and Architect.
  - a. Review sample panel.
  - b. Review tooling requirements for masonry.
  - c. Review procedures and installation requirements of flexible flashings.
  - d. Review, installation, handling and protection of architectural precast units from chipping and discoloration.

#### 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. 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.

1.7 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 down both sides of walls and hold cover securely in place.
  - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
  
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
  
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
  
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates or setting beds. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with the following requirements:
  - 1. Cold-Weather Construction: When the anticipated daytime low temperature is within the limits indicated, use the following procedures:
    - a. 40 to 32 deg F: Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F.
    - b. 32 to 25 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Heat masonry units to 40 deg F. Maintain mortar and grout above freezing until used in masonry. Use heat on both sides of walls under construction.
    - c. 25 to 20 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F.
    - d. 20 deg F and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F.

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2. Cold-Weather Protection: When the anticipated daytime low temperature is within the limits indicated, coordinate with the General Contractor to provide the following protection. This is in addition to construction procedures specified above:
    - a. 40 to 32 deg F: Cover masonry with insulating blankets for 48 hours after construction.
    - b. 32 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 72 hours after construction.
  3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.
- E. Hot-Weather Requirements: Coordinate with the General Contractor to 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, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

## 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 U.L. requirements for fire-resistance ratings indicated.

### 2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  2. Provide square-edged units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
  1. Density Classification: Normal weight.
  2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
  3. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
  4. Fire Rated Concrete Masonry Units: Provide 2 and 3-Hour UL Fire Rated CMU in locations indicated.



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### C. Concrete Building Brick: ASTM C 55.

1. Density Classification: Normal weight.

## 2.3 MASONRY LINTELS

- A. 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 BRICK

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

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

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

1. Product: Endicott Manganese Ironspot Velour.
2. Grade: SW.
3. Type: FBS.
4. Size (Actual Dimensions): Norman; 3-5/8 inches wide by 2-1/4 inches high by 11-5/8 inches long.
5. Application: Use where brick is exposed unless otherwise indicated.

## 2.5 STONE TRIM UNITS (Engraved Granite Block)

- A. Granite: ASTM C 615/C 615M.

1. Description: Medium-grained, gray stone. Uniform pattern, without veining.
2. Refer to Section 012100 "Allowances".

## 2.6 MORTAR AND GROUT MATERIALS

- A. General: Mortar and grout may be provided in one of two options; field mix of Portland cement, lime and sand or with specified Portland Cement-Lime Mix. Colored Portland Cement-Lime Mix may also be used in lieu of mortar pigments.

- B. Portland Cement: ASTM C 150, Type I or II.

- 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.
  - 1. Available Products:
    - a. Lafarge: Eaglebond Portland and Lime, Type "S".
    - b. Ciment Quebec, Inc.: Portland and Lime / Type S.
    - c. Dragon Cement and Concrete: Type S Masonry Cement.
    - d. Quikrete: Portland and lime Quikrete.
- E. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
  - 1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
  - 2. Pigments shall not exceed 10 percent of portland cement by weight.
  - 3. Products:
    - a. Colored Portland Cement-Lime Mix:
      - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
      - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
      - 3) Lafarge North America Inc.; Eaglebond.
      - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Davis Colors; True Tone Mortar Colors.
    - b. Solomon Colors, Inc.; SGS Mortar Colors.
- G. Aggregate for Mortar: ASTM C 144.
- H. Aggregate for Grout: ASTM C 404.
- I. Water: Potable.

## 2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
  - 1. Interior Walls: Mill- 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: 16 inches o.c.
  7. Provide in lengths of not less than 10 feet.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.
1. Available Products:
    - a. Dayton Superior Corporation, Dur-O-Wal Division; DA 320 Ladur.
    - b. Hohmann & Barnard, Inc.; #220 Ladder-Mesh.
    - c. Sandell: Ladder Reinforcement.
    - d. Wire-Bond; Series 200, Single Wythe.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
1. Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
  2. Available Products:
    - a. Duro-wall; D/A 360 Ladur-eye.
    - b. Hohmann & Barnard; Lox-All Adjustable Eye-Wire, #270.
    - c. Wire-Bond; Series 800, Composite Hook and Eye.

## 2.8 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 ASTM A 641/A 641M, Class 1 coating.
  2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
  3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
  2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.

3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.
- D. 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.
1. Available Products:
    - a. Hohmann and Barnard #PTA 420.
    - b. Heckman: No. 419, Pin type.
    - c. Wire Bond: Partition Top Anchor.
- E. 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.
- F. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
    - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
  2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.078-inch- thick, stainless-steel sheet.
  3. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch-diameter, stainless-steel wire unless otherwise indicated.
  4. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
    - a. Anchor Section: Zinc-alloy barrel section with adjustable flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive wire tie and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
    - b. Product:
      - 1) Hohmann & Barnard, Inc.: 2-Seal™ Tie (Wing Nut).

## 2.9 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim."

- B. Metal Drip Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, as follows:
1. Metal Drip Edges at Base of Wall: Fabricate from 26 gage stainless steel. Extend at least 4-1/2 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and back edge turned up 1-1/2 inch.
    - a. Available Product: No. 1008 by Heckman Building Products Inc.
  2. Metal Drip Edges at Lintels and Shelf Angles: Fabricate from 26 gage stainless steel. Extend at least 1-1/2 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
    - a. Available Product: No. 1007 by Heckman Building Products Inc.
- C. Flexible Flashing: Use the following unless otherwise indicated:
1. 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 0.040 inch.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Advanced Building Products Inc.; Strip-N-Flash.
      - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
      - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
      - 4) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
      - 5) Henry Company; Blueskin SA TWF.
      - 6) Hohmann & Barnard, Inc.; Tetroflash.
      - 7) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
      - 8) Polyguard Products, Inc.; Polyguard 400.
      - 9) Sandell Manufacturing Co., Inc.; Sando-Seal.
    - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
    - c. Termination Seal: Provide one of the following:
      - 1) Dow Corning Corporation; 790.
      - 2) GE Construction Sealants; SCS2700 SilPruf LM.
      - 3) Tremco Incorporated: Spectrem 1.
- D. 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.

## 2.10 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Holmann & Barnard: #NS – Closed Cell Neoprene.
  - b. Sandell: Closed Cell Neoprene.
  - c. Wire Bond: 3000 Horizontal.
  
- 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. Weep/Vent Products: Use the following unless otherwise indicated:
  1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Advanced Building Products Inc.; Cell Vent.
      - 2) Heckmann Building Products Inc.; No. 85 Cell Vent.
      - 3) Hohmann & Barnard, Inc.; QV Quadro-Vent.
      - 4) Sandell Construction Solutions: Cell Vent.
      - 5) Wire-Bond; Cell Vent (3601).
  
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Advanced Building Products Inc.; Mortar Break II or Mortar Maze 2inch thick.
    - b. Mortar Net by Mortar Net USA, LTD.; Model MN 10-2.
  
- F. 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, provide one of 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.

2.11 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type X, closed-cell product extruded with an integral skin.
  - 1. Available Products: Provide the following or approved substitute.
    - a. Dow Chemical Company; Styrofoam CavityMate SC.
      - 1) Provide for gypsum sheathing walls.
      - 2) Provide 4 foot by 8 foot sheets with shiplap edges, thickness as indicated on the drawings.
  - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.12 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate (Spic and Span) and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  - 1. Available Manufacturers:
    - a. 202V Vana-Stop; Diedrich Technologies, Inc.
    - b. Sure Klean Vana Trol; ProSoCo, Inc.

2.13 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime mortar unless otherwise indicated.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  - 1. For masonry below grade or in contact with earth, use Type M.
  - 2. For brick veneer masonry, use Type S.
  - 3. For reinforced masonry, use Type S.
  - 4. 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. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
  - 1. Pigments shall not exceed 10 percent of portland cement by weight.
  - 2. Mix to match Architect's sample. Allow for 2 bag mix.
  - 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
    - a. Face brick.
- 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.
  - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that foundations are within tolerances specified.
  - 2. Verify that reinforcing dowels are properly placed.
  - 3. Verify that built-in items are in proper location and ready for roughing into masonry work.
  - 4. Examine wall framing and sheathing to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

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



- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.
  - 2. In addition to ASTM C90 requirements for defects in CMU units, do not install interior CMU units with defects larger than 1/4 inch, and defects visible from 5 feet away.
- F. Bracing Walls During Construction: It is the sole responsibility of the masonry contractor to design and provide temporary bracing of masonry walls during construction. Refer to NCMA Tek Bulletin 3-4B and applicable OSHA standards. Provide 3' vinyl construction fencing around Restricted Zones.

### 3.3 TOLERANCES

#### A. Dimensions and Locations of Elements:

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

#### B. Lines and Levels:

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

#### C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed CMU Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Bond Pattern for Exposed Brick Masonry: Unless otherwise indicated, lay exposed masonry in 1/3 running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- E. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- F. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- G. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- H. 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.
- I. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

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1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

### 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. Lay solid masonry units or brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

#### C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

#### D. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is necessary, remove mortar and replace.

### 3.6 CAVITY WALLS

#### A. Bond wythes of cavity walls together using one of the following methods:

1. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

#### B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

#### C. Installing Cavity-Wall Insulation:

1. At steel framed walls, screw masonry anchors through insulation, air/vapor barrier membrane, and gypsum sheathing into steel studs. Press insulation tight to substrate and tighten wing nut, holding insulation in place without gaps between back side of insulation and air/vapor barrier. If anchor misses stud, remove anchor and insulation, patch holes in air/vapor barrier membrane, and replace insulation with new insulation. Seal insulation joint gaps and gaps between insulation and adjacent construction with minimal expanding foam.

### 3.7 MASONRY JOINT REINFORCEMENT

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

### 3.8 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
  - 1. Fasten screw-attached anchors through insulation, air/vapor barrier, and sheathing to wall framing with metal fasteners of type indicated.
  - 2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of cavity insulation.
  - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  - 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than 1 anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

### 3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control joints in unit masonry where indicated. Provide control joints in masonry partitions at changes in wall heights, at control joints in the wall bottom support material, within 8' of wall corners or intersections for walls greater than 16', and at not less than 24' on center for straight walls. 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. Install control joints in veneer masonry as indicated on the drawings or, if not indicated, at a maximum spacing of 24 feet on center. Locate joints at door and window jambs inasmuch as possible.

1. Provide joints at both sides of windows and doors 6 foot wide or wider.
- C. Form control joints in concrete masonry as follows:
1. Install preformed control-joint gaskets designed to fit standard sash block.
  2. Joint reinforcement shall be discontinuous at control joints.
  3. Structural bond beam reinforcement shall be continuous through control joints.
- D. Form expansion joints in brick made from clay or shale as follows:
1. Build in compressible joint fillers and set back from face of veneer to form open joint 3/4 inch deep and not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."
- E. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### 3.10 LINTELS

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

### 3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, 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. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install through-wall flashing, at base of wall, as follows, unless otherwise indicated:
1. Install metal drip flashing on top of masonry unit.
  2. Adhere flexible flashing to vertical leg of metal drip flashing.
  3. Extend metal drip flashing across thickness of insulation, adhere flexible flashing to vertical leg of metal drip flashing, turned up a minimum of 8 inches and adhering to air barrier membrane. Seal top of through-wall flashings to air barrier with sealant.
  4. At lintels and shelf angles, extend metal drip flashing a minimum of 8 inches into masonry at each end. At heads and sills, extend metal drip flashing 8 inches at ends and turn up not less than 2 inches to form end dams.
- C. Install through-wall flashing, at lintel and shelf angles, as follows, unless otherwise indicated:
1. Install metal drip flashing on top of masonry unit.

2. Adhere flexible flashing onto metal drip flashing.
  3. Extend metal drip flashing across thickness of insulation, adhere flexible flashing to vertical leg of metal drip flashing, turned up a minimum of 8 inches and adhering to air barrier membrane. Seal top of through-wall flashings to air barrier with sealant.
  4. At lintels and shelf angles, extend metal drip flashing a minimum of 8 inches into masonry at each end. At heads and sills, extend metal drip flashing 8 inches at ends and turn up not less than 2 inches to form end dams.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use specified weep/vent products to form weep holes.
  2. Space weep holes 24 inches o.c., unless otherwise indicated.
  3. Provide weep holes not more than 8 inches from end of lintels.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
1. Space vents 24 inches o.c.

### 3.12 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.

### 3.13 FIRESTOPPING

- A. Firestopping: Refer to Section 078443 "Joint Firestopping" for installation requirements. Provide firestopping, as part of the work of this section, at the top of fire-rated masonry walls

between top of partition and underside of structure above, both for new and existing conditions. Where gypsum wallboard is installed at the top of rated existing masonry walls, the firestopping will be provided by others.

1. Bearing walls, not subject to vertical movement, may be grouted solid between top of wall and underside of structure, in lieu of firestopping.

### 3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to TMS 402/ACI 530/ASCE 5.
  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 Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- E. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

### 3.15 REPAIRING, POINTING, AND CLEANING

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

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2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  4. Clean concrete masonry with job-mixed detergent solution by cleaning method indicated in NCMA TEK 8-2A and as applicable to type of stain on exposed surfaces.
- E. Final Cleaning for Brick: After mortar is thoroughly set and cured for a minimum of 7 days, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  3. Protect metal roof and/or floor deck from contact with cleaner by covering with polyethylene film. Should damage occur to metal deck, repair damaged deck finish by re-priming steel deck materials or applying a ZRC coating to galvanized deck materials.
  4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water. Do not use pressure sprayers, garden hose type and pressure only.
  5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20 Revised, and manufacturer's printed instructions.

### 3.16 MASONRY WASTE DISPOSAL

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

END OF SECTION 042000



SECTION 051200 – STRUCTURAL STEEL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 01 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

- A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Structural steel is that work defined in AISC “Code of Standard Practice” and as otherwise shown on drawings.

1.03 RELATED WORK

- 1. Section 053000 – Metal Deck
- 2. Section 055000 - Metal Fabrications

1.04 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with latest provisions of the following, except as otherwise indicated:
  - 1. AISC “Code of Standard Practice for Steel Buildings and Bridges”, Latest Edition.
    - a. The provisions of Section 10, “Architecturally Exposed Structural Steel”, apply to exposed steel elements for this project. In addition, exposed welds and edges shall be ground to provide smooth surface.
    - b. Exclude the word “structural” in reference to the “Design Drawings” in section 3.1 of the Code.
  - 2. AISC “Specification for Structural Steel Buildings”, including “Commentary” and Supplements issued thereto.

3. AISC “*Specifications for Structural Joints using ASTM A 325 or A 490 Bolts*” approved by the Research Council on Structural Connections of the Engineering Foundation.
  4. AISC 341, “Seismic Provisions for Steel Buildings”.
  5. AWS D1.1 - “Structural Welding Code” - Steel.
  6. AWS D1.3 - “Structural Welding Code” - Sheet Steel.
  7. ASTM A6 “General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.”
  8. “Code of Federal Regulations, Part 1926” per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).
- B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 “Standard Qualification Procedure.”
1. Provide certification that welders to be employed in work have satisfactorily passed AWS D1.1 qualification tests and maintained a current certification. Current certification and/or continuity log shall be submitted and be available in the field.
  2. If re-certification of welders is required, retesting will be the Contractor’s responsibility.
- C. Fabricator Qualifications:
1. Fabricator must be a member of the American Institute of Steel Construction (AISC), be certified for BU – Certified Building Fabricator. Fabricator shall be certified at time of bidding and for duration of project.

#### 1.05 SUBMITTALS

- A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 01.
- B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner’s Notice to Proceed.
- C. All submittals shall be reviewed and returned to the Architect within 10 working days.
- D. INCOMPLETE SUBMITTALS WILL NOT BE REVIEWED.
- E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by

Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1 have been complied with.

- F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.
- G. Hardcopy Submittals: Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.
- H. Electronic Submittals:
  - 1. Contractor shall include in the submittal schedule an indication of submittals that are intended to be submitted electronically. Upon receipt of the submittal schedule, the Engineer reserves the right to indicate submittals that will not be accepted electronically. Paper copies of such submittals shall be furnished as referenced in this specification.
  - 2. The Engineer reserves the right to require paper copies of submittals that are received electronically. Provide Engineer one (1) paper copies in addition to the electronic submittal. Paper copy will be retained and electronic copy will be returned. Review cycle for such submittals shall not commence until such time that the paper copies are received.
  - 3. Electronic Submittals shall be submitted in Protected Document Format (PDF) compatible with Bluebeam version 12 or later. Electronic files shall not be broken into smaller individual files. File sizes too large to process email or within a file transfer protocol (FTP) site shall be provided on a CD.
  - 4. The submission of submittals electronically does not relieve the contractor of their responsibility to review the submittal prior to transmission to the Engineer. Electronic Submittals shall include contractor comments, and a statement and/or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with. Electronic submittals without the Contractor's approval will be rejected and returned.
  - 5. The Engineer assumes no responsibility for the printed reproduction of submittals reviewed electronically, transmission errors or returned electronic submittals that become corrupted or are otherwise not accessible by the Contractor's or Subcontractor's computer hardware and/or software.
- I. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel certified mill reports for each grade of steel covering chemical and physical properties and yield strengths.
  2. High-strength bolts (each type), including nuts and washers.
  3. Structural steel primer paint (where applicable).
  4. Structural steel top coat paint (where applicable). (Refer to Division 9.)
  5. AWS D1.1 Welder certifications.
  6. Expansion/Adhesive Anchors (coordinate with section 03 30 00).
- J. Fabricator's Quality Control Procedures: Fabricator shall submit their written procedural and quality control manuals, and evidence of periodic auditing of fabrication practices by an approved inspection Agency.
- K. Fabricator's Certificate of Compliance: At completion of fabrication, fabricator shall submit a certificate of compliance stating that the work was performed in accordance with the construction documents.
- L. Shop Drawings:
1. Shop Drawing Review: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings and/or Erection Drawings is prohibited. Shop drawings and/or Erection drawings created from reproduced Construction Documents will be returned without review.
    - a. Review of the shop drawings will be made for the size and arrangement of the members and strength of the connections. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility.
    - b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings indicating all members, braced frames, moment frames and connections. Incomplete submittals will not be reviewed.
  2. Connection Design: Submit design calculations prepared and stamped by a Professional Engineer registered in the State of Maine for all beam and column connections not tabulated in the AISC "Manual of Steel Construction" (ASD or LRFD). Submit design for all building braced frames and moment frames where applicable, as indicated on design drawings. Connection designs shall be submitted prior to or with the Shop Drawing Submittal.
    - a. Fabricator and Erector are responsible to provide connections that meet the requirements of AISC standards. All shop and field welds, bolts,

plates and miscellaneous components required to provide complete connection assemblies shall be provided.

- b. Unless indicated otherwise, simple shear connections shall be provided for the full uniform load capacity of the beam for non-composite construction, and 1.5 times the full uniform load capacity of the beam for composite construction. All connections shall have a minimum of 2 bolts rows in the line of force, and no connection capacity shall be less than 10 kips (unfactored). A tabulation of the simple shear connections shall be provided with the connection submittal.
  - c. Braced frame connections: A brace force has been provided on the drawings.
  - d. Braced frame connections shall be designed utilizing the Uniform Force Method, with a connection geometry that does not induce a moment on the connected beam or column.
  - e. To the greatest extent possible and where required herewithin, welds shall be designed and detailed to be installed downhand.
  - f. Column splices shall be designed and detailed per AISC standards. Column splices at braced frames and/or moment frames shall develop the full capacity of upper section.
  - g. Moment connections not specified, that are part of the lateral resisting system, shall be designed for the full moment capacity of the beam. Where permitted, bolted moment connections shall not reduce the flange area of the beam by more than 15 percent. Weld access holes for welded moment connections shall be detailed and fabricated per the recommendations of FEMA 350.
3. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place, in ample time to not delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Steel materials shall be stored in a manner to avoid

ponding of precipitation on members. Repair or replace damaged materials or structures as directed.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

- A. Structural Steel Shapes, Plates and Bars (U.N.O): ASTM A 36 minimum, higher strength steel is acceptable.
- B. Structural Steel Hot Rolled Wide Flange Shapes: ASTM A 992 Grade 50 (ASTM A572 Grade 50 with special requirements per AISC Technical Bulletin #3, dated March 1997)
- C. Steel Tube: ASTM A 500, Grade B,  $F_y = 46$  ksi.
- D. Steel Pipe: ASTM A 53, Grade B.
- E. Anchor Bolts: ASTM F1554, Grade 36 weldable steel, unless noted otherwise on drawings. Anchor rods that are to be exposed to weather, located in unheated enclosures, or in contact with pressure treated lumber shall be hot dipped galvanized. All anchor bolts shall be headed or double nutted. "J" or "L" type anchor bolts are not permitted. Unless otherwise noted, specified embedment it to top face of head or nut.
- F. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.
- G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
  - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325 or ASTM A490. Refer to drawings for diameter.
  - 2. Direct tension indicator washers or bolts may be used at Contractor's option.
  - 3. Provide hot-dipped galvanized fasteners at relieving angles.
- H. Steel Shear Studs: Headed type manufactured from steel conforming to ASTM A108 Grade C1015 by KSM or Nelson. Refer to Drawings for diameter and length.
- I. Deformed Bar Anchors, manufactured by Nelson and attached to structural steel. Refer to drawings for diameter and length.
- J. Electrodes for Welding:
  - 1. Minimum 70 ksi electrodes. Filler material shall meet the grouping requirements per AWS D1.1 Table 3.1 for matching strength of connected materials.

2. All filler metal used welding shall meet the following Charpy V-Notch (CVN) requirements.
  - a. 20 ft-lb at 0 degrees Fahrenheit unless noted otherwise.
  - b. 20 ft-lb at -20 degrees Fahrenheit and 40 ft-lb at 70 degrees Fahrenheit at all complete joint penetration (CJP) groove welds.
- K. Structural Steel Coatings shall be as specified in the Structural Steel Coatings section of this specification, and as specified in Division 9.
- L. Steel Coatings for Exterior Exposed Steel: Except where indicated to be primed and painted, Hot Dipped Galvanized per ASTM A123/A123M (latest edition). Galvanizing shall be applied in a manner to provide Class C faying surfaces for slip critical connections. See Structural Steel Coatings section for additional requirements for galvanizing and painting.
- M. Non Shrink Cement-Based Grout: See Section 03 30 00
- N. Drilled Anchors: Expansion and adhesive by HILTI, SIMPSON or POWERS/RAWL as indicated on the drawings.

2.02 FABRICATION:

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
  1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
  2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
  1. Provide field bolted connections, except where welded connections or other connections are indicated.
  2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
- C. High-Strength Bolted Connection: Install high-strength threaded fasteners in accordance with AISC "Specification for Structural Joints using ASTM A 325 or A 490 Bolts". Unless otherwise indicated, all bolted connections are to be tightened to the snug tight condition as defined by AISC.

- D. Welded Construction: Comply with AWS Codes for procedures, appearance and quality of welds, and methods used in correcting welding work.
- E. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
- F. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- G. Fabricator, Erector and General Contractor shall coordinate safety requirements for the project, in accordance with OSHA Part 1926. Provide all necessary pieces and fabrications as required to safely erect and access the structure for the duration of project construction.
- H. Camber, if any, is indicated on the drawings. Camber indicated is the required camber at time of erection. Contractor shall survey camber prior to placing metal deck.

### 2.03 STRUCTURAL STEEL COATINGS

- A. Coordinate coating requirements with the Architect, and with Division 9 of the specifications.
- B. To the greatest extent possible, structural steel coatings shall be shop applied.
- C. Coordinate steel markings with coating system to eliminate “bleed through” on steel permanently exposed to view.
- D. Galvanizing, priming and painting for structural steel permanently exposed to view shall meet the requirements of Section 10 of the Code of Standard Practice, “Architecturally Exposed Structural Steel”.
- E. Provide venting/drainage holes in closed tubular members to be hot-dipped galvanized. Holes shall be provided in a location hidden from view in the final condition and in a manner that will not reduce the strength of the member. Hole locations shall be clearly indicated on the Shop Drawings and are subject to review by the Architect.
- F. Follow manufacturer’s installation and safety instructions when applying coatings. Adhere to recoat time recommendations set forth by manufacturer.
- G. General: Structural steel shall be shop primed unless noted otherwise.
- H. Steel which is to receive spray-on fireproofing shall not to be primed or painted, unless specified by the Architect.
- I. Coatings: All exterior steel and/or steel permanently exposed to view shall receive a coating. Unless noted otherwise, refer to Division 9 specifications for products and surface preparation requirements.



- J. Brick masonry loose lintels and relieving angle assemblies, including fasteners, shall be hot dipped galvanized, unless noted otherwise on the Architectural Drawings. Complete all shop fabrication prior to galvanizing assemblies.
- K. Unheated structural steel to be enclosed with architectural finishes, including but not by limitation, canopy members and/or roof pop-up members shall be primed with rust inhibitive mio-zinc filled primer, Tnemec Series 394 unless noted otherwise. Follow manufacturer's instructions for surface preparation and application. Substitution shall be equal to the above specified products, and shall be submitted for review.
- L. Steel Embedded in Concrete/Below Grade: Steel which is embedded in concrete, below grade/slab level, or as otherwise indicated on the drawings, shall be field painted with cold-applied asphalt emulsion complying with ASTM D 1187. Paint embedded areas only. Do not paint surfaces which are to be welded until welding is complete.
- M. Field Touch-up: Touch-up all paint and galvanizing damage, including but not by limitation, damage caused during shipping, erection, construction damage, and field welded steel. See Division 9 specifications for additional requirements.

### PART 3 - EXECUTION

#### 3.01 ERECTION:

- A. General: Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- B. Erection Procedures: Comply with "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).
- C. Surveys: Employ a Registered Land Surveyor to verify elevations of concrete bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect and Structural Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been approved by Structural Engineer of Record. Additional surveys required to verify out-of-alignment work and/or corrective work shall be performed at the contractor's expense.
- D. Temporary Shoring and Bracing: This is the sole responsibility of the Contractor. Provide temporary shoring and bracing members with connections of sufficient strength to support imposed loads. Remove temporary members and connections when all permanent members are in place, and all final connections are made, including the floor and roof diaphragms. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Comply with OSHA Standard referenced previous. Retain the services of a Specialty Structural Engineer (Not the Engineer of Record) to design specialty shoring and bracing.

- E. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
1. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
  2. Welding to anchor bolts for corrective measures is strictly prohibited without prior written approval from the Engineer.
- F. Setting Plates and Base Plates:
1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations. Refer to division 3 of the project Specifications for anchor bolt installation requirements in concrete.
  2. Clean concrete bearing surfaces of bond-reducing materials. Clean bottom surface of setting and bearing plates.
  3. Set loose and attached base plates for structural members on wedges or shims until fully grouted support is provided. If shown on drawings, anchor bolt nuts under base plates are not intended for erection support of base plate or column.
  4. Pack non-shrink grout solidly between bearing surfaces and bases or leveling plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.
- G. Concrete slabs that are part of elevated floors framing systems shall achieve 28-day design strength prior to the application of any superimposed loads such as curtain walls, masonry veneer, mechanical equipment and stairs. Additional testing beyond that specified in division 3 required to verify the concrete strength prior to application of superimposed loads shall be done at the Contractor's expense.
- H. When installing expansion bolts or adhesive anchors, the contractor shall take measures to avoid drilling or cutting any existing reinforcement or damaging adjacent concrete. Holes shall be blown clean with compressed air and/or cleaned per manufacturer's recommendations prior to the installation of anchors.
- I. Field Assembly:
1. Set structural frames accurately to lines and elevations indicated.
  2. Align, adjust, level and plumb members of complete frame in to the tolerances indicated in the AISC Code of Standard Practice and in accordance with OSHA regulations.
  3. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

4. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  5. Splice members only where indicated and accepted on shop drawings.
  6. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
  7. Composite shear studs / deformed bar anchors shall be installed using stud welding process with an appropriately sized insulating ferrule. Fillet welding of shear studs is not permitted. Ferrules shall be broken free from the shear studs and removed from the deck surface along with all other debris.
- J. Tolerances: Erection tolerances shall meet the “Code of Standard Practice” except as noted. Cumulative tolerances of framing elements shall not exceed the available tolerances of façade support systems to ensure and provide a plumb façade face.
- K. Coat columns, base plates, and brace elements encased in concrete and/or below grade with cold-applied asphalt emulsion. Coordinate coating with concrete work.
- L. Erection bolts: Remove erection bolts. On exposed welded construction fill holes with plug welds and grind smooth at exposed surface.
- M. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as accepted by the Engineer of Record. Finish gas-cut sections equal to a sheared appearance when permitted.
- N. Coating Damage: Touch up shop applied paint or galvanizing whenever damaged or bare. See “Coatings” sections for additional requirements.
- O. Field Cut Beam Web Penetrations:
1. Field cut beam web penetrations are not permitted without written approval from the Structural Engineer.
  2. Gas cutting torches are not permissible for cutting beam web penetrations without written approval from the Structural Engineer.
  3. Beams with field cut beam web penetrations may require reinforcement, subject to the evaluation by the Structural Engineer.
  4. The evaluation of field cut web penetrations by the Structural Engineers for Design-Build Subcontractors, including but not by limitation, Mechanical, Electrical, Plumbing and Sprinkler Subcontractors shall be compensated by the General Contractor or Design-Build Subcontractor.
  5. The cost of executing field cut web penetrations and the associated beam reinforcement for Design-Build Subcontractors, including but not by limitation,

Mechanical, Electrical, Plumbing and Sprinkler Subcontractors shall be paid for by the General Contractor or Design-Build Subcontractor.

6. Field cut beam web penetrations may not be permitted in certain locations, subject to the evaluation by the Structural Engineer.
- P. Welders shall have current evidence of passing and maintaining the AWS D1.1 Qualifications test available in the field.
- Q. Welding electrodes, welding process, minimum preheat and interpass temperatures shall be in accordance with AISC and AWS specifications. Any structural steel damaged in welding shall be replaced.
- R. Field Welded Moment Connections:
1. Backing materials for top and bottom flanges for field welded moment connections shall be removed, backgouge the weld root, and apply a reinforcing fillet weld.
  2. Where top flange steel backing materials are utilized, the backing may be left in place. In this case, the backing material shall be welded with a reinforcing fillet weld.

### 3.02 QUALITY CONTROL:

- A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.
1. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.
- B. Testing: Owner shall engage an Independent Testing Agency to inspect all high-strength bolted and welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.
1. Testing agency shall conduct tests and state in each report which specific connections were examined or tested, whether the connections comply with requirements, and specifically state any deviations therefrom.
  2. Contractor shall provide access for testing agency to places where structural steel work is being fabricated, produced or erected so that required inspection and testing can be accomplished. Testing agency may inspect structural steel at plant before shipment. The Engineer, however, reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.
- C. Inspection Requirements (to be performed by the Independent Testing Agency):

1. Bolted Connections: Inspect all bolted connections in accordance with procedures outlined in the AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts.
2. Snug Tight Bolted Connections:
  - a. The inspector shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.
  - b. If the inspector does not monitor the installation of bolts, he shall visually inspect the connection to determine that all plies of connected material have been drawn together and conduct tests on a sampling connection bolts to determine if they have been tightened to the snug tight condition. The test sample shall consist of 10% of the bolts in the connection, but not less than two bolts, selected at random. If more than 10% of the tested bolts fail the initial inspection, the engineer reserves the right to increase the number of bolts tested.
3. Slip Critical Bolted Connections:
  - a. The inspector shall monitor the calibration of torquing equipment and the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.
  - b. If the inspector does not monitor the calibration or installation procedures, he shall test all bolts in the affected connection using a manual torque wrench to assure that the required pretension has been reached.
4. Field Welded Connections: inspect and test during fabrication of structural steel assemblies, and during erection of structural steel all welded connections in accordance with procedures outline in AWS D1.1. Record types and location of defects found in work. Record work required and performed to correct deficiencies.
  - a. Certify welders and conduct inspections and tests as required. Submit welder certifications to Engineer of Record. Perform visual inspection of all welds. Primary and secondary welds, including fillet welds, full penetration welds, and deck puddle welds, applied in the field and/or shop, shall be visually inspected.
  - b. Welds deemed questionable by visual inspection shall receive non-destructive testing. In addition, all partial and full penetration welds, and any other welds indicated on the drawings are to receive non-destructive testing. Non-destructive testing methods include the following:
    1. Radiographic Inspection (RT): ASTM E 94 and ASTM E 142;

minimum quality level "2-2T".

2. Ultrasonic Inspection (UT): ASTM E 164.
3. Magnetic Particle (MT) inspection procedures may be utilized at the inspectors discretion in addition to RT or UT inspection. MT procedures shall not replace RT or UT procedures without permission from the Structural Engineer.

c. All welds deemed unacceptable shall be repaired and retested at the Contractor's expense.

D. Composite Shear Studs/Deformed Bar Anchors:

1. Verify shear stud quantity and arrangement.
2. Visually inspect stud weld. A weld less than 360 degrees is cause for further testing by bending to 15 degrees per item 2 below. Strike all studs with a 3 pound sledge hammer with moderates force. Studs shall make a ringing sound when struck with the hammer. If a stud or studs breaks free, or fails to make a ringing sound, further testing shall be performed per item 4.
3. One stud in 100 shall be tested by bending to 15 degrees from vertical, and one stud in 200 shall be tested by bending to 30 degrees from vertical. Single bent studs may be left bent. Failure of stud weld during bend testing is cause for further testing per item 4.
4. When failure occurs during bend testing, additional bend testing shall be performed on 10 studs to either side of failed stud. Bend studs to 30 degrees from vertical. If failure occurs during additional testing, continue testing in series of 10 studs beyond failed stud until no failure occurs.
5. Straighten all studs that were bent in multiple stud testing. Replace all studs that fail.

E. Inspector shall verify that all ferrules are removed when applicable and that metal deck is free of debris prior to concrete placement.

F. Testing and inspection reports shall be submitted to the Owner, Architect and Engineer within 48 hours of completion of each test or inspection.

G. Nonconforming Work: Contractor shall be responsible for correcting deficiencies in structural steel work which inspections laboratory test reports have indicated to be not in compliance with requirements. Additional tests and/or surveys shall be performed, at the Contractor's expense, as may be necessary to show compliance of corrected work. Any costs associated with the Engineer's review and disposition of faulty works shall be borne by the Contractor.

END OF SECTION 051200

SECTION 053000 – METAL DECKING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 01 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. Extent of metal floor deck is shown on the drawings and includes type VL composite floor deck, cell closures, end plates, pour stops with vertical leg return lip, metal lath column closures, composite finish strips.

1.03 RELATED WORK

- 1. Section 051200 - Structural Steel
- 2. Section 055000 - Metal Fabrications

1.04 QUALITY STANDARDS

- A. Codes and Standards: Comply with provisions of the following codes and standards, except where more stringent requirements are indicated or specified:
  - 1. AISI "Specification for the Design of Cold Formed Steel Structural Members".
  - 2. AWS D1.1 "Structural Welding Code" - Steel
  - 3. AWS D1.3 "Structural Welding Code" - Sheet Steel
  - 4. Steel Deck Institute (SDI) " Design Manual for Floor Decks and Roof Decks".
  - 5. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

- B. Qualification of field welding: Qualify welding process and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."

1.05 SUBMITTALS

- A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 01.
- B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.
- C. All submittals shall be reviewed and returned to the Architect within 10 working days.
- D. Incomplete submittals will not be reviewed.
- E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1 have been complied with.
- F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.
- G. Hardcopy Submittals: Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.
- H. Electronic Submittals:
  - 1. Contractor shall include in the submittal schedule an indication of submittals that are intended to be submitted electronically. Upon receipt of the submittal schedule, the Engineer reserves the right to indicate submittals that will not be accepted electronically. Paper copies of such submittals shall be furnished as referenced in this specification.
  - 2. The Engineer reserves the right to require paper copies of submittals that are received electronically. Provide Engineer one (1) paper copies in addition to the electronic submittal. Paper copy will be retained and electronic copy will be returned. Review cycle for such submittals shall not commence until such time that the paper copies are received.



3. Electronic Submittals shall be submitted in Protected Document Format (PDF) compatible with Bluebeam version 12 or later. Electronic files shall not be broken into smaller individual files. File sizes too large to process email or within a file transfer protocol (FTP) site shall be provided on a CD.
  4. The submission of submittals electronically does not relieve the contractor of their responsibility to review the submittal prior to transmission to the Engineer. Electronic Submittals shall include contractor comments, and a statement and/or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with. Electronic submittals without the Contractor's approval will be rejected and returned.
  5. The Engineer assumes no responsibility for the printed reproduction of submittals reviewed electronically, transmission errors or returned electronic submittals that become corrupted or are otherwise not accessible by the Contractor's or Subcontractor's computer hardware and/or software.
- I. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these specifications.
  - J. Shop Drawings:
    1. Shop Drawing Review: Electronic files of structural drawings **will not** be provided to the contractor for preparation of shop drawings.
      - a. Submit detailed drawings showing layout and types of deck panels, galvanizing, shop paint, anchorage details, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing, and all other accessories. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility.
      - b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings. Incomplete submittals will not be reviewed.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Store materials to permit easy access for inspection and identification. Keep deck sheets off ground, using pallets, platforms, or other supports. Protect deck sheets and packaged materials from corrosion and deterioration.

- C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Materials shall be stored in a manner to avoid ponding of precipitation on members. Repair or replace damaged materials or structures as directed.

## PART 2 PRODUCTS

### 2.01 GENERAL:

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. United Steel Deck
2. Wheeling Corrugating Co.
3. Epic Metals Corporation
4. Vulcraft

- B. Materials:

1. Steel for Metal Deck Units:
  - a. Floor Deck Units: ASTM A653, Structural Quality, grade 40 or higher
2. Miscellaneous Steel Shapes: ASTM A36 minimum.
3. Sheet metal Accessories: ASTM A526, commercial quality, galvanized.

- C. Galvanizing: Conform to ASTM 924-94 with minimum coating class of G60 (Z180) as defined in ASTM A653-94.

- D. Flexible closure Strips: Manufacturer standard vulcanized, closed-cell, synthetic rubber.

### 2.02 FABRICATION:

- A. General: Form deck units in lengths to span 3 or more supports, unless otherwise noted on the drawings, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated. For roof deck units, provide deck configurations complying with SDI "Roof Deck Specifications," of metal thickness, depth and width as shown.

- B. Metal Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6" wide.
- C. Metal Closure Strips: Fabricate metal closure strips, cell closures, "Z" closures, column closures, pour stops, girder fillers and openings between decking and other construction, of not less than 0.045" min. (18 gage) sheet steel or as indicated on the drawings. Form to provide tight fitting closures at open ends of cells or flutes and sides of decking.
- D. Pour Stops: Minimum material thickness shall be 18 gage or as indicate on drawings.. Fabricate vertical leg to accommodate specified slab thickness. Fabricate horizontal leg to minimize field cuts. Provide welded attachment sufficient to resist forces during concrete placement.
- E. Provide all pour stops and accessories necessary to contain concrete for poured concrete surfaces.

### PART 3 EXECUTION

#### 3.01 INSTALLATION:

- A. Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.
- B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before permanently fastened. Deck shall be in full contact with members parallel to ribs and attached as indicated. Do not stretch or contact side lap interlocks.
- C. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
- D. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
- E. Coordinate and cooperate with the structural steel erector in locating decking bundles to prevent overloading of structural members.
- F. Do not use decking units for storage or working platforms until permanently installed.

3.02 FASTENING:

- A. Floor Deck: Fasten metal deck to supporting steel members as indicated on the Design Drawings: Each deck is to be fastened with a minimum of 5/8" diameter puddle welds spaced not more than 12" o.c. with a minimum of 2 welds per unit at each support. Secure deck units at 6" oc along brace lines, edge of building or at the edge of openings or deck discontinuity. Secure deck to each supporting member in ribs where sidelaps occur. Use welding washers where recommended by the deck manufacturer. Deck units shall bear over the ends of supports by a minimum of 1.5. Sidelaps: #10 Tek screws, 5/8" arc puddle welds or 1" long fillet welds, intervals not exceeding 36 inches. Crimped or button punched sidelaps are not permitted.
- B. Welding: Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
- C. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.
- D. Reinforcement at openings: Provide additional metal reinforcement and closures pieces as required for strength, continuity of decking and support of other work shown.
  - 1. Deck penetrations affecting no more than (1) deck rib need not be reinforced.
  - 2. For deck penetration affecting more than (1) deck rib, but less than 10", reinforce the opening with a 0.057" thick plate spanning between unaffected ribs, unless otherwise shown on the Design Drawings or supporting a piece of mechanical equipment (see item 3).
  - 3. Reinforce deck penetrations larger than 10" with the structural frame described in the Design Drawings.
- E. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units.
- F. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12" on center with at least 1 weld in each corner. Cut opening in roof sump bottom to accommodate drain size indicated.
- G. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

H. Touch-Up Painting:

1. Painted Deck: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.
  - a. Touch up painted surfaces with same type paint used on adjacent surfaces.
  - b. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

3.03 QUALITY CONTROL:

- A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.
- B. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.
- C. Testing: Owner shall engage an Independent Testing Agency to inspect all puddle welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.
- D. Deck Testing Requirements (to be performed by the Independent Testing Agency):
  1. Deck and accessory welding and/or attachments subject to inspection and testing. Work found to be defective will be removed and replaced at the Contractor's expense.
  2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, re-testing will be the Contractor's responsibility.

END OF SECTION 053000



SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Load-bearing wall framing.
  - 2. Exterior non-load-bearing wall framing.
  - 3. Ceiling joist framing.
  - 4. Exterior gypsum sheathing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
  - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
  - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel framing.
  - 1. Include structural analysis calculations signed and sealed by the qualified professional engineer responsible for their preparation, licensed in the State of Maine.
    - a. Review of structural analysis calculations is for general conformance with requirements and completeness. The responsibility for correctness rests solely with the designer. The Architect reserves the authority to require resubmittal for observed deficiencies, or incompleteness.
  - 2. Include complete details for all member connections at openings and other discontinuities of the wall system.
  - 3. Specify connections to supports at top and bottom of wall including spacings at jambs of openings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
  1. Provide seal of professional engineer on calculations and shop drawings.
  2. Same engineer shall provide on-site review of installation.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- E. SSMA Section Properties: Provide cold-formed metal framing members with section properties that equal or exceed the properties indicated in SSMA's "Product Technical Information" publication.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Dale/Incor.
  2. Dietrich Metal Framing; a Worthington Industries Company.
  3. EB Metal, U.S.
  4. MarinoWare; a division of Ware Industries.



5. Super Stud Building Products, Inc.
6. The Steel Network, Inc.
7. United Metal Products, Inc.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
  1. Design Loads: As indicated on the structural drawings or otherwise approved.
  2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height for metal siding, 1/600 of the wall height for masonry veneer.
    - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft..
    - c. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/360 of the wall height for metal siding, 1/600 of the wall height for masonry veneer.
    - d. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
  3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
  4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
    - a. Upward and downward movement of 3/4 inch.
  5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
  1. Floor and Roof Systems: AISI S210.
  2. Wall Studs: AISI S211.
  3. Headers: AISI S212.
  4. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

## 221 CONGRESS STREET

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

### 2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
  1. Grade: ST33H or ST50H as required by structural performance.
  2. Coating: G90.
- B. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
  1. Grade: 50, Class 1.
  2. Coating: G90.

### 2.4 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0428 inch.
  2. Flange Width: 1-5/8 inches (162).
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: Matching steel studs.
  2. Flange Width: 1-1/4 inches (125).
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0428 inch.
  2. Flange Width: 1-5/8 inches (162).
- D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
  1. Minimum Base-Metal Thickness: 0.0428 inch.
  2. Flange Width: 1-5/8 inches (162).

### 2.5 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0428 inch.

2. Flange Width: 1-5/8 inches (162).
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
  2. Flange Width: 1-1/4 inches (125).
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. VertiClip, by The Steel Network. Series: SL, SLT, SLB, AND SLS as required by attachment condition.
    - b. Fast Top Clips by Dietrich, with FastClip deflection screws.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: As required to resist design loads.
  2. Flange Width: 1 inch plus the design gap for 1-story structures and 1 inch plus twice the design gap for other applications.
- E. Approved alternates to double studs for openings: ASTM A653/A653M, Grade 50 (340), 50ksi (340MPa), minimum yield strength, 65ksi (450 MPa), minimum tensile strength, G-60 (Z180) hot-dipped galvanized coating.
1. JamStud™ by The Steel Network, Inc.
    - a. Approved engineered connections for openings: StiffClips® as manufactured by The Steel Network, Inc.
  2. HDS by Dietrich.

## 2.6 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch.
  2. Flange Width: 1-5/8 inches, minimum.

## 2.7 WALL SHEATHING

- A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. GlasRoc Sheathing; CertainTeed (BPB America, Inc.)
  - b. Dens-Glass Gold; Georgia-Pacific Corporation.
  - c. eXP Extended Exposure Sheathing; National Gypsum Company.
  - d. Securock Sheathing; United States Gypsum Co.
2. Type and Thickness: Type X, 5/8 inch thick.

## 2.8 FRAMING ACCESSORIES

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

## 2.9 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
  1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2. Minimum size; No. 10-16 (D=0.19"), with length adequate for 3 threads to project through the connected members.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
  2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

## 2.10 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. General: If required by the selected Air Barrier manufacturer, provide the following joint sealant:
- B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
1. Available Product: 895 Silicone building Sealant by Pecora Corporation.
  2. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.
- C. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

## 2.11 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.
- C. Thermal Insulation for Closed Framing: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.
- D. Safing Insulation: ASTM C 612, maximum flame-spread and smoke-developed indices of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following density, type, thermal resistivity, and fiber color:
1. Nominal density of 4 lb/cu. ft., Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F.
  2. Color: Natural.
  3. Thickness: 4 inches.

4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fibrex Insulations Inc.
  - b. Owens Corning.
  - c. Thermafiber.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

#### 3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing is to be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install field-fabricated, cold-formed framing and securely anchor to supporting structure.
  1. Screw or bolt wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
  1. Cut framing members by sawing or shearing; do not torch cut.
  2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

- a. Locate mechanical fasteners and install according to Shop Drawings, and complying with the following:
  - b. Power-actuated fasteners: In concrete, minimum spacing = 3", minimum edge distance = 3". In structural steel, minimum spacing = 1 ½", minimum edge distance = ½".
  - c. Screws: Minimum spacing and edge distance = ½".
- E. Install framing members in one-piece lengths or multiple lengths as required by the design and load requirements.
  - F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
  - G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
  - H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
  - I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings or as indicated in the shop drawings.
  - J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
    - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
  - 1. Anchor Spacing: As shown on Shop Drawings.
- B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
  - 1. Stud Spacing: As indicated on Drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
  - 1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
  - 2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
  - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.
  - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
  - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
  - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:



1. Stud Spacing: As required by design, but not greater than 24 inches on center.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  1. Install single deep-leg deflection tracks and anchor to building structure.
  2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  3. Connect vertical deflection clips to infill studs and anchor to building structure.
  4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
  2. Bridging: Cold-rolled steel channel, mechanically fastened to webs of punched studs.
- F. Install horizontal support of safing insulation where indicated at exterior wall framing. Provide stud-track solid blocking of width and thickness to match studs.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.6 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
  1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
  2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
  1. Joist Spacing: 16 inches.
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
- G. Secure joists to load-bearing interior walls as indicated in the shop drawings to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

### 3.7 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
1. Fasten gypsum sheathing to wood framing with screws.
  2. Fasten gypsum sheathing to cold-formed metal framing with screws.
  3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
  4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
  2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
  2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

### 3.8 FIELD QUALITY CONTROL

- A. Engineer of cold-form metal framing shall review on-site installation and provide written documentation that installation conforms to design intent. If corrective work is required, same engineer shall specify repair work necessary to provide conforming installation.
- B. Remove and replace work where test results indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.9 REPAIRS AND PROTECTION

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

END OF SECTION 054000



SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Elevator machine beams and hoist beams,.
5. Steel shapes for supporting elevator door sills.
6. Shelf angles.
7. Metal ladders.
8. Elevator pit sump covers.

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

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

C. Related Requirements:

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

1.2 COORDINATION

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

### 1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
  - 2. Paint products.
  - 3. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  - 1. Steel framing and supports for overhead doors.
  - 2. Steel framing and supports for mechanical and electrical equipment.
  - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 4. Elevator machine beams and hoist beams,.
  - 5. Steel shapes for supporting elevator door sills.
  - 6. Shelf angles.
  - 7. Metal ladders.
  - 8. Elevator pit sump covers.
  - 9. Loose bearing and leveling plates for applications where they are not specified in other Sections.
  - 10. Loose steel lintels.
- C. Samples for Verification: For each type and finish of extruded nosing and tread.
- D. Delegated-Design Submittal: For alternating tread devices, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

### 1.5 QUALITY ASSURANCE

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

### 1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design alternating tread devices.
- B. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
  - 1. Provide ladders meeting the OSHA requirements of 29CFR 1910.27.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
    - b. ICI Devco Coatings; Catha-Coat 313.
    - c. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
    - d. PPG Architectural Finishes, Inc.; Epoxy Zinc Rich Primer 97-670.
    - e. Sherwin-Williams Company (The); Zinc Clad IV, B69A8/B69V8.
    - f. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
  - 1. Available Products:
    - a. Sealmastic, Type 1; W. R. Meadows
    - b. Hydrocide 600; Sonneborn Building Products.
    - c. Karnak 100 AF; Karnac Chemical Corp.



- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
  - 1. Available Products:
    - a. Five Star Grout by Five Star Products, Inc.
    - b. Masterflow 928 Grout by Master Builders Technologies.
    - c. SonogROUT 10K by Sonneborn.
    - d. 14K Hy Flow by Sonneborn.
- G. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

## 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

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- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

### 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

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

### 2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
  - 1. Provide mitered and welded units at corners.
  - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.

### 2.8 METAL LADDERS

- A. General:
  - 1. Comply with ANSI A14.3, except for elevator pit ladders.
  - 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Fabricate ladders from materials as detailed on the drawings or if not indicated, as follows:
  - 1. Space siderails 18 inches apart unless otherwise indicated.
  - 2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
  - 3. Rungs: 3/4-inch-diameter steel bars, spaced 12 inches o.c..
  - 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

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5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
7. Primeladders, including brackets and fasteners, with zinc-rich primer.

### 2.9 ELEVATOR PIT SUMP COVERS

- A. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 1/2 inch in least dimension.
- B. Support Frame: Provide 1-1/2 by 1-1/2 by 1/4 inch steel angle around perimeter of sump pit, fastened with 1/4 inch galvanized expansion anchors.
- C. Galvanize steel elevator pit cover, including support frame and fasteners.

### 2.10 LOOSE BEARING AND LEVELING PLATES

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

### 2.11 LOOSE STEEL LINTELS

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

### 2.12 STEEL WELD PLATES AND ANGLES

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

### 2.13 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

#### 2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Provide coating for iron and steel fabrications applied by the hot-dipped process, Duragalv by Duncan Galvanizing. The galvanizing bath shall contain high grade zinc and other earthy materials. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
  2. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

### 3.3 INSTALLING BEARING AND LEVELING PLATES

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

### 3.4 ELEVATOR SUMP PIT COVER

- A. Set perimeter support angles 1/4 inch below the edge of the sump pit to allow the sump cover plate to set flush with elevator pit floor.

3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

SECTION 055100 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads.
2. Industrial-type stairs with steel grating treads.
3. Steel tube railings attached to metal stairs.
4. Steel tube handrails attached to walls adjacent to metal stairs.

B. Related Requirements:

1. Section 055213 "Pipe and Tube Railings" for steel guardrails not associated with metal pan stairs.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft..
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Handrails and Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. applied in any direction.
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
- b. Infill load and other loads need not be assumed to act concurrently.

- D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Component Importance Factor is 1.5.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:
  - 1. Paint products.
  - 2. Grout.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Selection: For products involving selection of color, texture, or design.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Welding certificates.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
  - 1. Preassembled Stairs: Commercial class.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
  - 1. Stairs and Handrails: Provide stairs and handrails as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
    - a. Treads and Risers:



- 1) Provide treads with uniform riser heights and tread widths.
  - 2) Provide no less than 11 inch tread width.
- b. Nosings:
- 1) Provide the radius of curvature at the leading edge of the tread of not greater than 1/2 inch.
  - 2) Provide sloped risers or the angle on the underside of the nosing will not be less than 60 degrees from the horizontal.
  - 3) Project nosings not more than 2-1/4 inch.
- c. Size and Spacing of Handrails:
- 1) Handrail Diameter: 1-1/4 to 2 inches.
  - 2) Space between Wall and Rails: 2-1/4 inches.
  - 3) Either round ends of handrails or return ends of handrails smoothly to floor, wall or post.
  - 4) Handrails shall not rotate within their fittings.
- d. Locations of Handrails:
- 1) Provide handrails at both sides of stairs.
  - 2) Provide continuous inside handrail on switchback or dogleg stairs.
  - 3) Provide continuous handrails on both sides of the stair. When handrails are not continuous, extend handrails at least 12 inches beyond the top riser and at least the width of one tread beyond the bottom riser. At the top, the extension shall be parallel with the floor or ground surface. At the bottom, continue the handrail to slope for a distance of the width of one tread from the bottom riser.
  - 4) Mount the top of handrail gripping surface between 34 and 38 inches above stair nosing or ramp surface.
- e. Structural Strength of Handrails: Refer to article in this section "Performance Requirements".
2. Notify Architect of details or specifications not conforming to code.

## 1.6 COORDINATION

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

- C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

## PART 2 - PRODUCTS

### 2.1 METALS, GENERAL

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

### 2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- C. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- D. Wire Rod for Grating Crossbars: ASTM A 510.
- E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

### 2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Screws: ASME B18.2.1.
- F. Plain Washers: Round, ASME B18.22.1.
- G. Lock Washers: Helical, spring type, ASME B18.21.1.

- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
  - 1. Available Products:
    - a. Five Star Grout by Five Star Products, Inc.
    - b. Masterflow 928 Grout by Master Builders Technologies.
    - c. SonogROUT 10K by Sonneborn.
    - d. 14K Hy Flow by Sonneborn.
- F. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
- G. Welded Wire Fabric: ASTM A 185/A 185M, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

#### 2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
  - 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld exposed corners and seams continuously unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

## 2.6 STEEL-FRAMED STAIRS

- A. Stair Framing:
  - 1. Fabricate stringers of steel channels.
    - a. Provide closures for exposed ends of channel stringers.
  - 2. Construct platforms of steel channel headers and miscellaneous framing members as indicated.
  - 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
  - 4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
  - 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

- B. Metal-Pan Stairs (Basement to Ground Floor): Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
1. Steel Sheet: Uncoated cold-rolled steel sheet.
  2. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
  3. Shape metal pans to include nosing integral with riser.
  4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
    - a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.
- C. Metal Bar-Grating Stairs (Parking System to Basement): Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
1. Fabricate treads and platforms from welded steel grating with 1-1/4-by-3/16-inch bearing bars at 15/16 inch o.c. and crossbars at 4 inches o.c.
  2. Surface: Plain.
  3. Finish: Shop primed.
  4. Fabricate grating treads with rolled-steel floor plate nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
  5. Fabricate grating platforms with nosing matching that on grating treads. Provide toeplates at open-sided edges of grating platforms. Weld grating to platform framing.

## 2.7 STAIR RAILINGS

- A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
1. Configuration: As indicated on the drawings.
- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.
- C. Form changes in direction of railings as follows:
1. As detailed.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
  - 1. Connect posts to stair framing by direct welding unless otherwise indicated.
  - 2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

## 2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply universal shop primer to concrete pan stairs and railings.
  - 3. Apply zinc rich primer to grating stair and railings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- G. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

### 3.2 INSTALLING METAL STAIRS WITH ANCHORED BASEPLATES

- A. Clean concrete and masonry bearing surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate.

### 3.3 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
  - 1. Anchor posts to steel by welding directly to steel supporting members.
  - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Use type of bracket with predrilled hole for exposed bolt anchorage. Provide bracket with 2-1/4-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
  - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
  - 4. For steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
  - 5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

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6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 055100



SECTION 057300 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel decorative railings.

B. Related Requirements:

1. Section 012300 "Alternates" for alternate finishes for railings.
2. Section 055112 "Metal Pan Stairs" for steel tube railings associated with metal pan and grating stairs.

1.2 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.3 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, and attachment details.

1. For illuminated railings, include wiring diagrams and roughing-in details.

- B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  - 1. Steel: 72 percent of minimum yield strength.
- C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Infill of Guards:
    - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
    - b. Infill load and other loads need not be assumed to act concurrently.

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- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

- 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

- 1. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

### 2.3 STEEL AND IRON

- A. Tubing: ASTM A 500/A 500M (cold formed) or ASTM A 513.

- B. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

### 2.4 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide Type 304 stainless-steel fasteners where exposed.

- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

### 2.5 MISCELLANEOUS MATERIALS

- A. Wood Rail Caps: Clear, straight-grained hardwood rails secured to exposed metal subrail.

- 1. Species: Epi.
  - 2. Finish: Clear sealer as specified in Section 099300 "Staining and Transparent Finishing."
  - 3. Staining: None.
  - 4. Profile: As indicated on the drawings.

- B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

## 2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
- I. Form changes in direction as follows:
  - 1. As detailed.
- J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of hollow railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. 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. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

## 2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings (Alternate 2A):
  1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
  2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
  3. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
  4. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
  5. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
  6. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, but galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
  1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Shop prime uncoated railings with universal shop primer unless zinc-rich primer is indicated.
  - 2. Do not apply primer to galvanized surfaces.
- G. High-Performance Coating for Steel, Topcoat (Base Bid for Rail Finish): High-build, semigloss polyurethane enamel.
  - 1. Product: Subject to compliance with requirements, provide one of the following:
    - a. Tnemec Company, Inc.; Series 1075 Endura-Shield.
    - b. Provide primers and intermediate coats as recommended by Tnemec.
- H. Shop Priming Galvanized Steel: Where galvanized steel is indicated to be primed for field painting, provide factory-applied polyamide epoxy primer over specially prepared galvanized steel, 2.0 mils dry film thickness minimum, Primergalv by Duncan Galvanizing. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations, and as recommended by coating manufacturer. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years experience in the successful performance of the process outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coating with the same facility as outlined herein.
- I. Factory-Applied High-Performance Architectural Finish (Alternate 2B): Provide factory-applied polyurethane color coating, 2.5 mils dry film thickness minimum, architectural coating over primed galvanized steel as previously referenced, Colorgalv by Duncan Galvanizing. Apply coating at the galvanizer's plant in a controlled environment meeting applicable environmental regulations, and as recommended by coating manufacturer. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years experience in the successful performance of the process outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coating with the same facility as outlined herein and will assume single-source responsibility for galvanizing, priming and finish coating.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

#### 3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.

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

### 3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

### 3.4 ANCHORING POSTS

- A. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  - 1. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

### 3.5 INSTALLING HANDRAIL CAPS

- A. Apply wood handrail caps to top rails, where indicated, complying with manufacturer's written instructions for cutting, mounting, and finishing.
- B. Minimize number of joints in wood caps by installing in lengths as long as possible. Allow for shortening of wood cap caused by splicing process; butt ends together to produce hairline joint.

### 3.6 CLEANING

- A. Clean wood rails by wiping with a damp cloth and then wiping dry.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

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- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300



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SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 01 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, and without limiting the generality thereof furnish and install the following:
  - 1. Wood framing, including joists, rafters, outriggers, scab-ons, headers, stringers, posts, studs, plates, truss bracing and similar members.
  - 2. Wood grounds, nailers, blocking and sleepers.
  - 3. Wood furring.
  - 4. Floor, roof and wall sheathing and underlayment.
  - 5. Miscellaneous carpentry as indicated or required and not specified under other Sections of the Specifications.
  - 6. Fasteners and accessories as indicated and required for rough carpentry.
  - 7. Treated wood as specified.
- B. Related Work Specified Elsewhere:
  - 1. Finish carpentry: Section 062013.
  - 2. Metal studs: Section 054000.
  - 3. Gypsum wall sheathing: Section 054000.
  - 4. Underlayments: Division 07

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5. Furnishing and installing of doors and frames: Division 08.

1.03 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with provisions of the latest edition of the following except where more stringent requirements are shown or specified:

1. International Building Code, 2009 Edition – International Code Council
2. ANSI/AF&PA (American Forest & Paper Association) – NDS National Design Specification for Wood Construction – Latest Edition
3. AHA (American Hardboard Association) A135.4 – Basic Hardboard.
4. ALSC (American Lumber Standards Committee) – Softwood Lumber Standards.
5. ANSI A208.1 – Mat-Formed Wood Particleboard.
6. APA (American Plywood Association).
7. AWWPA (American Wood Preservers Association) C1-All Timber Products – Preservative Treatment by Pressure Process.
8. AWWPA (American Wood Preservers Association) C20-Structural Lumber Fire Retardant Treatment by Pressure Process.
9. NELMA (New England Lumber Manufacturer’s Association).
10. NLGA (National Lumber Grades Authority)
11. NIST (National Institute of Standards and Technology, U. S. Department of Commerce [DOC])
12. NFPA (National Forest Products Association)
13. NFPA (National Fire Protection Association)
14. SPIB (Southern Pine Inspection Bureau).
15. WCLIB (West Coast Lumber Inspection Bureau).
16. WWPA (Western Wood Products Association).
17. “Code of Federal Regulations, Part 1926” per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

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- B. Lumber shall be supplied in accordance with the following agencies:
  - 1. Lumber Grading Agency: Certified by NLGA for structural framing.
  - 2. Sheathing Grading Agency: Certified by APA or ICBO approved certification agency. For non-APA rated plywood, provide ICC ES Evaluation report.
  - 3. Grading stamp shall be on lumber and plywood.
  - 4. Submit manufacturer's certificate certifying that products meet or exceed specified requirements.
- C. Panelized/Prefabrication plant inspection: Prefabrication plant is subject to plant inspection completed by the Engineer-of-Record or an approved Third Party Inspection Agency. Inspections shall be performed at the Contractor's expense. Plant inspection does not relieve the Contractor of the obligation to perform work in accordance with the Construction Documents or from implementing their own shop and field quality control program.

### 1.04 SUBMITTALS

- A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with Division 1.
- B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.
- C. All submittals shall be reviewed and returned to the Architect within 10 working days.
- D. Incomplete submittals will not be reviewed.
- E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in sections Division 1 have been complied with.
- F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

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G. Hardcopy Submittals: Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.

H. Electronic Submittals:

1. Contractor shall include in the submittal schedule an indication of submittals that are intended to be submitted electronically. Upon receipt of the submittal schedule, the Engineer reserves the right to indicate submittals that will not be accepted electronically. Paper copies of such submittals shall be furnished as referenced in this specification.
  2. The Engineer reserves the right to require paper copies of submittals that are received electronically. Provide Engineer one (1) paper copies in addition to the electronic submittal. Paper copy will be retained and electronic copy will be returned. Review cycle for such submittals shall not commence until such time that the paper copies are received.
  3. Electronic Submittals shall be submitted in Protected Document Format (PDF) compatible with Adobe Acrobat Professional version 7.0 or later. Electronic files shall not be broken into smaller individual files. File sizes too large to process email or within a file transfer protocol (FTP) site shall be provided on a CD.
  4. The submission of submittals electronically does not relieve the contractor of their responsibility to review the submittal prior to transmission to the Engineer. Electronic Submittals shall include contractor comments, and a statement and/or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with. Electronic submittals without the Contractor's approval will be rejected and returned.
  5. The Engineer assumes no responsibility for the printed reproduction of submittals reviewed electronically, transmission errors or returned electronic submittals that become corrupted or are otherwise not accessible by the Contractor's or Subcontractor's computer hardware and/or software.
- I. Panelized Construction Fabrication and Erection Drawings: If the contractor elects to use prefabricated wall, floor and/or roof panels, the panels shall meet or exceed the framing indicated in the construction documents, and applicable code requirements. Review by Engineer is for structural elements only; dimensional review is specifically excluded for this scope. Contractor remains solely responsible for proper fit-up of panels. Shop drawings shall include the following:

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1. Framing layouts for all panel assemblies as required to completely describe panel construction.
  2. Identification of all framing, sheathing and connection components
  3. Sheathing Lap Details
  4. Fastener patterns, spacing, length, diameter and finish for all prefabricated panels including framing and sheathing conditions.
  5. Field fastening and construction details
  6. Alternate framing connections that vary from design documents shall be submitted to the Engineer for approval prior to preparation of the shop drawings. Acceptance of alternate framing connections is subject to Engineer's review based on to project condition. Contractor is responsible to provide as-detailed conditions if alternate connections are not accepted.
- J. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards). Product data shall include ICC/ICBO Evaluation Reports indicating conformance to standards specified here within.
1. Engineered Wood Products
  2. Pressure Treated Lumber
  3. Fire Treated Lumber and/or Plywood
    - a. Include physical properties of the treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D5516 and ASTM D5664.
    - b. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment.
    - c. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
  4. Sheathing
  5. Samples of Exposed to View Wood Members: Submit two samples, 6 inches long, illustrating wood grain, stain, and finish.
  6. Hangers, Hardware and Accessories

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### 1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Protect materials from warping or other distortion by stacking to resist movement.
- B. Follow manufacturer's recommendations for storage of Engineered Wood Products and connection hardware.

## PART 2 - PRODUCTS

### 2.01 LUMBER MATERIALS

- A. Lumber, General: Factory-mark each piece of lumber with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.
- B. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
  - 1. Provide dressed lumber, S4S, unless otherwise indicated.
  - 2. Provide seasoned lumber with 19% maximum moisture content at time of dressing.
- C. For structural framing (4" and wider and from 2" to 4" thick), provide the following grade and species:
  - 1. Spruce-Pine-Fir (SPF) #1/2 or better, NLGA Graded, unless noted otherwise on Structural Drawings, Fire Retardant Treated where noted here within and/or on the Construction Documents. Minimum Design Stresses:
    - a. Fb: 875 psi
    - b. Ft: 450 psi
    - c. Fv: 135 psi
    - d. Fc<sub>⊥</sub>: 425 psi
    - e. Fc: 1,150 psi
    - f. E: 1,400,000 psi
  - 2. Pressure treated lumber: Southern Yellow Pine #2 or better. Minimum Design Stresses:

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- a. Fb: 1,300 psi
- b. Ft: 775 psi
- c. Fv: 175 psi
- d. Fc<sub>⊥</sub>: 565 psi
- e. Fc: 1,650 psi
- f. E: 1,400,000 psi

3. See structural drawings for grades and bending stress at specific locations.

D. Miscellaneous Lumber: Provide wood for support or attachment of other work including cant strips, bucks, nails, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:

1. Moisture content: 19% maximum for lumber items not specified to receive wood preservative treatment.
2. Grade: Construction Grade light framing size lumber of any species or board size lumber as required. Provide construction grade boards (NELMA, NLGA or WCLB) or No.2 boards (SPIB, NLGA, NELMA, or WWPA).

### 2.02 SHEATHING LOCATIONS

- A. Roof Sheathing: NIST/DOC PS-1 or PS-2 rated, Exposure 1, 3/4 inch thick, 48 x 96 inch sized sheets, tongue and groove.
- B. Floor Sheathing: NIST/DOC PS-1 or PS-2 rated, Exposure 1, 3/4 inch thick, 48 x 96 inch sized sheets, tongue and groove.
- C. Wall Sheathing: NIST/DOC PS-1 or PS-2 rated, Exposure 1, 1/2 inch thick, 48 x 96 inch sized sheets, square edges.
- D. Wall Sheathing at Shear Walls: DOC PS-1 or PS-2 rated, Exposure 1, 48 x 96 inch sheets, square edges, unless noted otherwise.
- E. Thicknesses indicated are nominal.
- F. Sheathing shall be stamped with grading agency stamp
- G. Sheathing shall be Fire Retardant Treated where noted on architectural drawings.
- H. Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated

plywood panels where required per Code requirements. Paint as required by electrical code.

2.03 ENGINEERED WOOD PRODUCTS

- A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which, current model code research or evaluation reports exist that evidence compliance with building code in effect for Project. Provide depths and widths as indicated.
  - 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. Source and Species: Unless otherwise indicated, lumber sources in Engineered Wood Products shall be of single source and species.
  - 3. Adhesives shall be exterior type, complying with ASTM D2559.
  - 4. Substitutions: Substitutions of Engineered Wood Products other than those specified will be permitted only with written certification from the manufacturer that the substituted items "meets or exceeds" all properties of the specified product, including engineering, serviceability, aesthetic and durability characteristics. Substitutions shall not be made without written approval of the Architect and Engineer.

B. Laminated-Veneer Lumber (LVL): Lumber manufactured by laminating wood veneers in a continuous press using an exterior-type adhesive complying with ASTM D 2559 to produce members with grain of veneers parallel to their lengths and complying with the following requirements:

Boise Cascade	$F_b = 3080 \text{ psi}, E = 2.0 \times 10^6$
I-Level:	$F_b = 2600 \text{ psi}, E = 2.0 \times 10^6$

C. Parallel-Strand Lumber (PSL): Lumber manufactured by laying up wood strands using an exterior-type adhesive complying with ASTM D 2559, and cured under pressure to produce members with grain of strands parallel to their lengths and complying with the following requirements:

I-Level :  $F_{cII} = 2,900 \text{ psi}, F_b=2900 \text{ psi}, E = 2.0 \times 10^6$

D. I-Joists: Meet manufacturer's standards for all properties and stiffness, for I-Joist series indicated.

Boise Cascade: BCI Series, as indicated on the drawings



I-Level: TJI Series, as indicated on the drawings

- E. Laminated Strand Lumber (LSL): Lumber manufactured by laying up wood strands using an exterior-type adhesive complying with ASTM D 2559, and cured under pressure to produce members with laminations of strands parallel to their lengths and complying with the following requirements:

I-Level:  $F_b = 1,700$  psi,  $E = 1.3 \times 10^6$  (depths to 8 5/8")  
 $F_b = 1,700$  psi,  $E = 1.7 \times 10^6$  (depth 9 1/4" and up)

## 2.04 ACCESSORIES

### A. Fasteners, Anchors, Connectors and Hardware:

1. Fasteners (for wood framing): Nail fasteners shall meet requirements of ASTM F1667. Unless noted otherwise, nails referenced on drawings are to be Common Nails with dimensions as follows:
  - a. 8d: 2 1/2" long by 0.131" diameter shank with 0.281" diameter head
  - b. 10d: 3" long by 0.148" diameter shank with 0.312" diameter head
  - c. 12d: 3 1/4" long by 0.148" diameter shank with 0.312" diameter head
  - d. 16d: 3 1/2" long by 0.162" diameter shank with 0.344" diameter head
2. Anchor Bolts: ASTM A307 headed and SSTB Anchor Bolts by Simpson StrongTie, unless noted otherwise. "J" or "L" type anchor bolts shall not be substituted.
3. Screw fasteners (where indicated on drawings or required to install connection hardware):
  - a. SD & SDS Screws by Simpson Strong Tie
  - b. RSS Screws by GRK Fasteners, (800) 263-0463
  - c. Timberlok Screws by Fasten Master.
  - d. Wood Screws: ANSI/ASME Standard B18.6.1
4. Lag Screws: ANSI/ASME Standard B18.2.1. Provide lead hole per NDS Chapter 11.
5. Through Bolts: ANSI/ASME Standard B18.2.1:
  - a. Holes for through bolts shall be a minimum of 1/32nd and a maximum of 1/16th larger than bolt diameter.

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- b. A standard cut washer shall be provided between the wood and bolt head, and wood and nut, unless noted otherwise.
- B. Structural Framing Connectors, Hardware or Joist Hangers: As indicated on the drawings or sized to suit framing conditions, manufactured by Simpson or approved alternate.
1. Unless noted, fill all nail holes to achieve manufacturer's maximum reaction rating.
  2. Use nail diameter and length as specified by connector manufacturer. Substitutions of pneumatic nails or "joist hanger" (non standard length) nails shall not be made without written authorization of the Engineer.
- C. Construction Adhesive: APA AFG-01, approved for use with type of construction panel indicated by both adhesive and panel manufacturer.
- D. ALL ANCHORS, CONNECTORS AND FASTENERS IN CONTACT WITH PRESSURE TREATED LUMBER, FIRE RETARDANT TREATED LUMBER AND/OR AT EXTERIOR EXPOSURE SHALL HAVE COATINGS AS FOLLOWS, UNLESS NOTED OTHERWISE:
1. Anchor Bolts/Bolts/Lag Bolts: Hot Dipped Galvanized, ASTM A123
  2. Connection Hardware, unless otherwise noted: Simpson Strongtie Z-Max (G185 per ASTM A653) or Hot Dipped Galvanized (HDG, ASTM A123). Use hot dipped galvanized fasteners, ASTM A153 with these hangers.
  3. Nails and Fasteners, unless otherwise noted: Hot Dipped Galvanized, ASTM A153. Use type 304 or 316 stainless steel fasteners with stainless hardware
  4. Fasteners used in conjunction with Fire Retardant Lumber shall be coated per the manufacturer's recommendations. Some Fire Retardants may require the use of stainless steel fasteners. If the manufacturer has no specific recommendation, provide Hot Dipped Galvanized fasteners, ASTM A153.
  5. Proprietary coatings used in conjunction with pressure treated fastener coatings will be permitted with written permission from the Architect and Engineer.

## 2.05 FACTORY WOOD TREATMENT

### A. PRESSURE TREATED LUMBER (P. T.)

1. Wood Preservative (Pressure Treatment): AWWA Treatment, ACQ-C (amine formulated), ACQ-D or CA-B, ammonia free.
2. The use of ACZA and CCA treated lumber is strictly prohibited.
3. Retention:

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- a. Above Ground Use: ACQ: 0.25 pcf, CA-B: 0.10 pcf
  - b. Ground Contact Use: ACQ: 0.40 pcf, CA-B: 0.21 pcf.
4. See Section the “Fasteners, Anchors, Connectors and Hardware” portion of this specification for fastener, anchor and hardware requirements for use with pressure treated lumber.
  5. Pressure treated lumber shall not contain ammonia unless authorized by the Architect and Engineer. Ammonia content shall be verified with the Pressure Treatment manufacturer.

### B. FIRE RETARDANT TREATED LUMBER:

1. Fire retardant treated lumber shall meet the specifications of the AWPA C20/C27, Interior Type A Fire Retardant, TP Monitored STD DB 90.
  - a. Product: D-Blaze by Chemical Specialties, Inc, Charlotte, NC
  - b. Substitutions are subject to written approval from the Architect, Building Code Official and/or the Engineer.
2. The following shall be Fire Retardant Treated:
3. Fire retardant treated lumber shall be re-dried after treatment in accordance with AWPA Standards C20. Allowable values must be adjusted in accordance with NDS. Lumber treater shall supply certificate of compliance.

## PART 3 - EXECUTION

### 3.01 PREFABRICATED CONSTRUCTION REQUIREMENTS (PANELIZED CONSTRUCTION, CONSTRUCTED OFF-SITE)

- A. Prefabrication shall not commence until shop drawings have been approved by the Engineer and Architect.
- B. Panels shall meet or exceed the framing designed in the construction documents, and applicable code requirements.
- C. Framing shall not be drilled, notched or cut for any reason without prior written approval from the Structural Engineer (ie. passage of wiring, piping).
- D. Quality Assurance Requirements:
  1. Panelized/Prefabrication plant inspection: Prefabrication plant is subject to plant inspection completed by the Engineer-of-Record or an approved Third Party Inspection

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Agency prior to shipment to the jobsite. Inspections shall be performed at the Contractor's expense. Plant inspection does not relieve the Contractor of the obligation to perform work in accordance with the Construction Documents or from implementing their own shop and field quality control program.

2. Panel sheathing shall not be covered with air barrier (Tyvar, Tyvek, Construction Paper, etc) prior to shipment and until visual inspection by Engineer is complete.
3. Wall panels shall be constructed utilizing results of an as-built foundation survey to ensure that wall panels fit up correctly on foundation. Employ a Registered Land Surveyor to determine elevations and locations of concrete bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect and Structural Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to prefabricated wood construction have been approved by Structural Engineer of Record. Additional surveys required to verify out-of-alignment work and/or corrective work shall be performed at the contractor's expense.
4. Fasteners into sheathing and framing shall not be overdriven. Head of fastener shall be flush with surface of member being fastened. Maximum indentation tolerance from flush shall be 1/16 inch.

### E. Wall Framing Requirements:

1. At bearing walls, coordinate wall stud locations to line up directly below floor framing.
2. Wall studs shall line up vertically between floors.
3. Wall panels shall be constructed to provide full bearing of panel bottom plate to supporting structure.
4. Construct wall panels to allow for field placement of top-most top plate to ensure overlapping of all joints

### F. Sheathing Requirements:

1. All horizontal joints in plywood sheathing shall be blocked with full-depth blocking.
2. Attach adjacent panels together by overlapping sheathing a minimum of 1 ½" and fastening with approved fasteners specified.

## 3.02 FRAMING

- A. Set members level and plumb, in correct position.
- B. Unless noted otherwise, wall top plates shall be doubled. Install top plates with overlapping

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corners and at intersections with adjoining partitions. End joints in double top plates shall be offset at least 48 inches.

- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Place horizontal members, crown side up.
- E. Construct load bearing framing members full length without splices.
- F. Double members at openings over 24 inches wide and as indicated. Space short studs over and under opening to stud spacing.
- G. Double joists under partitions that run parallel to joist framing.
- H. Posts and columns shall be blocked at floor and/or roof levels with framing matching or exceeding post dimensions down to supporting foundation.
- I. Place sill gasket directly on cementitious foundation. Puncture gasket clean and fit tight to protruding foundation anchor bolts.
- J. Coordinate installation of wood decking, joist members, rafter members and/or prefabricated wood trusses.
- K. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
- L. Coordinate curb installation with installation of decking and support of deck openings, and roofing vapor retardant.
- M. Rough Carpentry Fastening Schedule: Unless otherwise indicated on the drawings, provide minimum nailing and fastening per IBC Table 2304.9.1.

### 3.03 SHEATHING

- A. Secure roof sheathing with longer edge perpendicular to framing members and with ends staggered and sheet ends over bearing provide gap between panels as recommended by manufacturer. Utilize H-clips at panel edges per manufacturer's recommendations or as indicated. Provide blocking where indicated on the Drawings.
- B. Secure floor sheathing with longer edge perpendicular to framing members and with ends staggered and sheet ends over bearing. Secure tongue in groove per manufacturers instructions. Glue and nail/screw as indicated. Provide blocking where indicated on the Drawings. Floor sheathing shall be laid out in a manner to prevent squeaks.

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- C. Secure wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered.
- D. Install telephone and electrical panel backboards with plywood sheathing material where required. Size as indicated, 6 inch larger than panel space required or per local Code requirements.

### 3.04 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Fasteners Driving Tolerance: Unless noted otherwise, fastener heads shall be driven flush with attached framing member or sheathing. Maximum indentation tolerance from flush shall be 1/16 inch.

END OF SECTION 061000

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cedar fence.
2. Exterior decking.

1.2 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 Selection: For each type of product involving selection of colors, profiles, or textures.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For manufacturer's warranties.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.5 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
- 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. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
3. RIS: Redwood Inspection Service, "Standard Specifications for Grades of California Redwood 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. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."

2.2 CEDAR FENCE

A. Lumber for Semitransparent-Stained Finish:

1. Species and Grade: Eastern white cedar, #1 – 1 face; NLGA, WCLIB, or WWPA.
2. Maximum Moisture Content: 15 percent.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced (smooth).

2.3 EXTERIOR WOOD DECKING

A. Board Decking: 1-inch actual thickness radius-edged S4S boards, with one face free of planer skip, machine burn, and torn or chipped grain.

1. Species: Ipe.
2. Grade: Premium.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.

1. For face-fastening siding, provide stainless steel nails.

B. Fasteners for Ipe Decking: Provide No. 7 stainless steel trim-head screws, 2-1/2 inches long. Provide Ipe Clip hidden deck fasteners or equal.

C. Pedestals: Provide Low Height Pedestal, model No. LO, by Bison Innovative Products, or equal, for leveling the wood deck framing over the EPDM roofing system.



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1. Weight Bearing Capacity: 1250 lbs.
2. Adjustment Range: 1-1/4 to 2 inches.
3. Accessories:
  - a. Stackable pedestals as required.
  - b. Base Leveler for pitched slope.

### 2.5 FABRICATION

- A. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- 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.

### 3.3 INSTALLATION, GENERAL

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

3.4 CEDAR FENCE INSTALLATION

- A. Install flat-grain lumber with bark side exposed to weather.
- B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.
  - 1. Use scarf joints for end-to-end joints.
  - 2. Stagger end joints in adjacent and related members.
- C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 DECKING INSTALLATION

- A. Install decking in accordance with manufacturer's recommendations.
- B. Decking to span a minimum of three framing members.
- C. Gapping: Provide the following gaps at sides and ends of decking:
  - 1. Sides: 1/4 inch gap.
  - 2. End-to-End: 1/8 inch gap.
  - 3. Abutting Solid Objects: 1/4 inch gap.

3.6 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior 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 exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

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.

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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 062013



SECTION 062023 - 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.
  - 2. Shelving and clothes rods.
  - 3. Interior stairs.

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 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 comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.5 FIELD CONDITIONS

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

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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 applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
- B. MDF: ANSI A208.2, Grade 130.

### 2.2 INTERIOR TRIM

- A. Lumber Trim for Opaque Finish (Painted Finish):
  1. Species and Grade: Poplar; B finish; NHLA.
  2. Finger Jointing: Allowed.
  3. Face Surface: Surfaced (smooth).

### 2.3 SHELVING AND CLOTHES RODS

- A. Closet Shelving: Made from the following material, 3/4 inch thick.
  1. MDF with radiused and filled front edge.
- B. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.
- C. Clothes Rods: 1-1/2-inch-diameter, clear, kiln-dried hardwood.
- D. Rod Flanges: Clear, kiln-dried, white maple turnings.

### 2.4 STAIRS

- A. Treads: 1-1/16-inch, clear, kiln-dried, edge-glued, white oak stepping with half-round nosing.
- B. Risers: 13/16-inch, clear, kiln-dried, edge-glued white oak stock.

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. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

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 for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
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 long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope 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. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
  2. Install trim after gypsum-board joint finishing operations are completed.
  3. 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 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 o.c. Use two fasteners at each framing member or fastener location for cleats 4 inches nominal 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 o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- D. 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.
  - A. 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 STAIR AND RAILING INSTALLATION

- A. Treads and Risers at Interior Stairs: Secure treads and risers by gluing and nailing to rough carriages.
  - 1. Cope treads and risers into wall, glue and nail in place.

3.7 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.

3.8 CLEANING

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

3.9 PROTECTION

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

END OF SECTION 062023



SECTION 064313 - WOOD STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Performance specification for wood stair design.

B. Related Requirements:

1. Section 055100 "Metal Stair" for steel railings associated with wood stairs.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design wood stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Wood stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft..
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Limit deflection of treads, platforms, and framing members to  $L/360$  or 1/4 inch, whichever is less.

C. Seismic Performance: Wood stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.5.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

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

1. Engineered wood products.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Expansion anchors.
5. Metal framing anchors.

#### 1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
  1. Provide seal of professional engineer on calculations and shop drawings.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
  1. Stairs and Handrails: Provide stairs and handrails as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
    - a. Treads and Risers:
      - 1) Provide treads with uniform riser heights and tread widths.
      - 2) Provide no less than 11 inch tread width.
    - b. Nosings:
      - 1) Provide the radius of curvature at the leading edge of the tread of not greater than 1/2 inch.
      - 2) Provide sloped risers or the angle on the underside of the nosing will not be less than 60 degrees from the horizontal.
      - 3) Project nosings not more than 2-1/4 inch.
  2. Notify Architect of details or specifications not conforming to code.

#### 1.6 COORDINATION

- A. Coordinate installation of anchorages for wood stairs. Furnish setting drawings, templates, and directions for installing anchorages, including anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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.
  - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.
- C. 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 DIMENSION LUMBER FRAMING

- A. Load-Bearing, Joists, Structural Blocking, and Other Framing: No. 2 grade or better.
  - 1. Species:
    - a. Douglas Fir, Douglas Fir-Larch.
    - b. Spruce-pine-fir; NLGA.
  - 2. Spruce-pine-fir (South) is not acceptable, except where pressure-treated materials are indicated.

2.3 ENGINEERED WOOD PRODUCTS

- A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

- 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, provide products by one of the following:
    - a. Boise Cascade Corporation.
    - b. Georgia-Pacific.
    - c. Louisiana-Pacific Corporation.
    - d. Weyerhaeuser Company.
- C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Louisiana-Pacific Corporation.
    - b. Weyerhaeuser Company.

#### 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.5 METAL FRAMING ANCHORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Simpson 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. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products 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.
- C. Materials:
  - 1. Interior Locations: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G90 coating designation.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
  - 1. Size: 2-by-12-inch nominal-size, minimum.
  - 2. Material: Solid lumber.
  - 3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
  - 4. Spacing: At least three framing members for each 36-inch clear width of stair.
- B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

END OF SECTION 055100





SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Modified bituminous sheet waterproofing.
  - 2. Blindsight sheet waterproofing.

1.2 PREINSTALLATION MEETINGS

- A. 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
  - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. Samples: For each exposed product and for each color and texture specified, including the following products:
  - 1. 8-by-8-inch square of waterproofing and flashing sheet.
  - 2. 4-by-4-inch square of drainage panel.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

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

1.6 FIELD 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. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
  - 1. Warranty Period: Three years from date of Substantial Completion.
- B. Installer's Special 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, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861.
    - b. Grace Construction Products; W.R. Grace & Co. -- Conn; Bituthene 3000/Low Temperature or Bituthene 4000.
    - c. Henry Company; Blueskin WP 200.
    - d. Meadows, W.R.,Inc; SealTight Mel-Rol.
  - 2. Physical Properties:

- a. Tensile Strength, Membrane: 250 psi 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; ASTM D 1970.
  - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
  - e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
  - f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
  - g. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96/E 96M, Water Method.
3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

## 2.2 BLINDSIDE SHEET WATERPROOFING

- A. Provide one of the two products listed below.
- B. Bonded HDPE or Polyethylene Sheet for Blindside Horizontal and Vertical Applications: Uniform, flexible, multilayered-composite sheet membrane consisting of either an HDPE film coated with pressure-sensitive adhesive and protective release liner, total 46-mil thickness, or a cross-laminated film of low- and medium-density polyethylene, coated with a modified asphalt layer and a nonwoven geotextile-fabric final layer, total 95-mil thickness; with the following physical properties:
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Grace Construction Products; W.R. Grace & Co. -- Conn; Preprufe 300R Plus and 160R Plus.
  2. Tensile Strength, Film: 2000 psi minimum; ASTM D 412.
  3. Low-Temperature Flexibility: Pass at minus 10 deg F; ASTM D 1970.
  4. Peel Adhesion to Concrete: 5 lbf/in. minimum; ASTM D 903, modified.
  5. Lap Adhesion: 2.5 lbf/in. minimum; ASTM D 1876, modified.
  6. Hydrostatic-Head Resistance: 231 feet; ASTM D 5385, modified.
  7. Puncture Resistance: 200 lbf minimum; ASTM E 154.
  8. Water Vapor Permeance: 0.01 perms maximum; ASTM E 96/E 96M, Water Method.
  9. Water Absorption: 0.5 percent maximum; ASTM D 570.
- C. TPO Sheet for Blindside Horizontal and Vertical Applications: Flexible membrane consisting of a TPO sheet coated with a pressure-sensitive butyl-alloy adhesive and protective release liner, total thickness 55-mil thickness with the following physical properties:
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Carlisle Coatings & Waterproofing Inc.; MiraPLY-H and MiraPLY-V.
  2. Tensile Strength, Film: 1696 psi minimum; ASTM D 412.
  3. Low-Temperature Flexibility: Pass at minus 10 deg F; ASTM D 1970.
  4. Peel Adhesion to Concrete: 5.9 lbf/in. minimum; ASTM D 903, modified.
  5. Lap Adhesion: 5.6 lbf/in. minimum; ASTM D 1876, modified.

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6. Puncture Resistance: 139 lbf minimum; ASTM E 154.
7. Water Vapor Permeance: 0.08 perms maximum; ASTM E 96/E 96M, Water Method.
8. Water Absorption: 0.7 percent maximum; ASTM D 570.

- D. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

### 2.3 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 sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.
- D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.
- F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.
- G. Protection Course: Thermal insulation.

### 2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 18 gpm per ft..
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. American Hydrotech, Inc; Hydrodrain 400.
    - b. Carlisle Coatings & Waterproofing; CCW MiraDRAIN 6200.
    - c. Grace Construction Products; W.R. Grace & Co. -- Conn; Hydroduct 220.

### 2.5 INSULATION

- A. Insulation, General: Comply with Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
  - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
  - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
  - 3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.
- B. 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. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
  - 1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
- F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.
  - 1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
- G. 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 fillets of liquid membrane on horizontal inside corners and as follows:

- a. At footing-to-wall intersections, extend liquid membrane in 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.
- H. 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 recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow it 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- 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, 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.
- D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- E. Seal edges of sheet-waterproofing terminations with mastic.
- F. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.
- G. 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 beyond repaired areas in all directions.
- H. Immediately install rigid insulation with butted joints over waterproofing membrane.

### 3.4 BLINDSIDE SHEET-WATERPROOFING APPLICATION

- A. Install bonded blindside sheet waterproofing according to manufacturer's written instructions.
- B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.
- C. Vertical Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.

1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.
- D. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.
- E. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.
- F. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.
- G. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

### 3.5 INSULATION INSTALLATION

- A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.
- B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

### 3.6 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 or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
  1. For vertical applications, install board insulation before installing drainage panels.

### 3.7 PROTECTION, REPAIR, 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 board insulation from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to

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abuse and cannot be concealed and protected by permanent construction immediately after installation.

- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326



SECTION 071613 – POLYMER-MODIFIED CEMENT WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes polymer-modified cement waterproofing for elevator pits.
- B. Related Sections:
  - 1. Division 03 Section “Cast-In-Place Concrete.”

1.2 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, installation, technical data, and tested physical and performance properties of waterproofing.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who has installed manufacturer's products or an experienced Waterproofing Applicator.
- B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

1.4 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.

1.5 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.

## PART 2 - PRODUCTS

### 2.1 POLYMER-MODIFIED CEMENT WATERPROOFING

- A. Trowel-applied, polymer-modified cementitious waterproofing to create positive and negative protection to water intrusion.
  - 1. Product: Five Star® Waterproofing by Five Star Products, Inc.
  - 2. Physical Properties: As follows, measured per standard test methods referenced:
    - a. Compressive Strength: ASTM C109; 3,000 psi in 4 hours, 7,000 psi in 28 days.
    - b. Bond Strength: ASTM C882; 2,400 psi in 7 days.
    - c. Permeability: CRD-C 48; 1/8 inch thickness; negative side –  $7.16 \times 10^{-13}$  cm/sec, positive side –  $7.96 \times 10^{-14}$  cm/sec.
    - d. Chloride Ion Permeability: ASTM C 1202; 1/8 inch thickness; Very low at 28 days..
    - e. Working Time at 70 degrees F: 20 minutes.

## 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. 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. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 WATERPROOFING APPLICATION

- A. Install waterproofing according to waterproofing manufacturer's written instructions and the following:
  - 1. Apply waterproofing to the floor and walls of the elevator pit to a minimum thickness of 1/8 inch after elevator jack hole has been poured around with cast-in-place concrete.
  - 2. Trowel all surfaces to a smooth, hard finish, free from pits, hollows and other defects.
  - 3. Provide 1 by 1 inch cant at intersection of horizontal and vertical surfaces.

3.4 PROTECTION AND CLEANING

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071613



SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Extruded polystyrene foam-plastic board.
  - 2. Mineral-wool blanket.
  - 3. Sprayed Foam insulation.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
  - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
  - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

- B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Chemical Company (The); Styrofoam Square Edge Insulation.
    - b. Owens Corning; Foamular® 250.
    - c. Pactiv Corporation; GreenGuard Type IV 25 PSI Insulation Board.
  - 2. R-Value: 5.0 per inch.
  - 3. Application: Foundation and below slab insulation.

## 2.2 MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Industrial Insulation Group, LLC (IIG-LLC).
    - b. Roxul Inc.
    - c. Thermafiber Inc.; an Owens Corning company.
  - 2. R-Value: 4.2 per inch.
  - 3. Application: Insulation in floor system.

## 2.3 SPRAYED FOAM INSULATION

- A. Sprayed Polyurethane Foam Sealant for Perimeter of Doors and Windows: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
  - 1. Products:
    - a. Great Stuff Window & Door by Dow
    - b. Froth-Pak by Insta-Foam Products, Inc.
    - c. Zerodraft Insulating Air Sealant by Zerodraft.
- B. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft..
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Corbond® Performance Insulation System.

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- b. Gaco Wallfoam 183M Closed Cell Spray Polyurethane Foam by Gaco Western.
  - c. Henry Permax 1.8 Closed Cell Foam Insulation.
  - d. Styrofoam™ SPF Insulation.
2. Flame/Smoke Properties: 25/450 in accordance with ASTM E84.
  3. R-Value, Aged: 6.2 per inch.
  4. Application: Miscellaneous locations indicated on the drawings.

### 2.4 ACCESSORIES

- A. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

## PART 3 - EXECUTION

### 3.1 PREPARATION

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

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.3 INSTALLATION OF SLAB INSULATION

- A. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
  1. If not otherwise indicated, extend insulation a minimum of 48 inches in from exterior walls.

### 3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. On vertical foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of 48 inches below exterior grade line.
- B. Butt panels together for tight fit.
- C. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
  - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.

### 3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
  - 5. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- C. Sprayed Foam Insulation: Comply with insulation manufacturer's written instructions applicable to products and applications. Spray insulation to envelop entire area to be insulated and fill voids. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam. Install into cavities formed by framing members to achieve thickness indicated on Drawings.



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3.6 PROTECTION

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

END OF SECTION 072100



SECTION 072616 - BELOW-GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Vapor retarders under slabs-on-grade.

1.2 DEFINITIONS

- A. Vapor Retarder: Material with a water vapor transmission rating of not over 0.04g per square foot per hour.
- B. Vapor Barrier: Material with a water vapor transmission rating of not over 0.015g per square foot per hour.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: 12 inch square units for each type of vapor retarder, vapor barrier, or air barrier indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials from physical damage and from deterioration by 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.

1.5 PROJECT CONDITIONS

- A. Separate and recycle waste materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers and Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following products listed in Part 2 of this Section.

2.2 VAPOR RETARDERS FOR UNDER SLABS

- A. Vapor Retarder with extremely low permeance for critically sensitive, low permeance floor coverings such as rubber, vinyl, urethane, epoxy and methyl methacrylate, as well as linoleum and wood, having the following qualities:
  - 1. Minimum Permeance: ASTM E-96, not greater than 0.01 perms.
  - 2. Tensile Strength: ASTM E154 or D638, Class A – over 45 lbf/in.
  - 3. Puncture Resistance: ASTM E-154, Class B – over 1700 grams.
  - 4. Water Vapor Barrier: ASTM E-1745, meets or exceeds Class B.
  - 5. Thickness of Barrier (Plastic) ACI 302.1R-96, not less than 15 mils.
  
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Stego Wrap, 15 mil thick vapor retarder by Stego Industries LLC, (877) 464-7834.
  - 2. Griffolyn® 15 by Reef Industries.
  - 3. Sealtight Perminator 15 mil Underslab Vapor-Mat by W.R. Meadows, Inc.
  - 4. Viper VaporCheck 16 by Insulation Solutions, Inc.
  
- C. Vapor-Retarder Tape (for slabs): Stego Warp red polyethylene tape or tape as recommended by the manufacturer.
  
- D. Double-Stick Edge Tape: Preformed 1-1/2" wide two-sided adhesive. Available products include "Fab Tape" by Reef Industries.
  
- E. Expansion Joint Filler: Installer may elect to use Deck-O-Foam Expansion Joint Filler by WR Meadows or equal. Foam expansion joint filler with pre-scored removable strip for installation of joint sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
  
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to vapor retarders, including removing projections capable of puncturing vapor retarders, or of interfering with attachment.
  
- B. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions applicable to products and application indicated.
- B. Extend retarders in thickness indicated to envelop entire area to be covered. Cut and fit tightly around obstructions. Remove projections that interfere with placement.

3.4 INSTALLATION OF UNDER-SLAB VAPOR RETARDERS

- A. Moisture vapor retarder system shall be installed at all interior floor slabs and as otherwise indicated in the drawings in strict accordance with the manufacturer's printed instructions and as follows:
  - 1. Snap chalk line along inside perimeter of foundation walls at top of slab elevation.
  - 2. Without wetting, clean a 3" wide band on the surface of the concrete below the chalk line at approximately mid-slab height. Remove dirt, residual form release, or other bond inhibiting surface contaminants. Grind smooth any surface projections within the band.
  - 3. While removing the contact paper on the backside, firmly press 2" wide double-stick edge tape onto wall, parallel to the chalk line on the cleaned band at mid-slab elevation.
  - 4. Remove contact paper on the face side.
  - 5. Apply a 12" wide strip of vapor retarder covering only the bottom 1" of contact surface on the edge tape. Cut, fit, and seal corner details with vapor retarder seaming tape.
  - 6. Align top edge of Deck-O-Foam expansion joint material to chalk line, and press material onto remaining 1" of exposed perimeter strip adhesive.
  - 7. Roll out vapor retarder material, overlapping edge rolls and all seams by 3". Tape all seams with vapor retarder seaming tape.
  - 8. Seal all penetrations (including pipes) per manufacturer's instructions.
  - 9. All tears, punctures, etc. to be repaired and taped as required to maintain the watertight integrity of the vapor retarder system.

3.5 PROTECTION

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

END OF SECTION 072616

SECTION 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes self-adhering, vapor-retarding, modified bituminous sheet air barriers.

1.2 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
  - 2. Review approved shop drawings and product submittals.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier assemblies.
  - 1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
  - 2. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.
- B. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- C. Warranty: Provide sample warrantee for Installer and Manufacturer.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and has a successful track record of installing the specified product for a minimum of 5 years.
- B. Mockups: Build mockups, as part of Integrated Exterior Mockup to set quality standards for materials and execution.
  - 1. Build integrated mockups of exterior wall assembly as shown on Drawings, incorporating backup wall construction, external cladding, window, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
    - a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
    - b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
  - 1. Protect substrates from environmental conditions that affect air-barrier performance.



2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

#### 1.9 WARRANTY

- A. Material Warranty: Manufacturer agrees to repair or replace components of air barrier system that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: 5 years from date of Substantial Completion.
- B. Special Project Warranty: Submit air barrier Installer's warranty, signed by Installer, covering Work of this Section, including all components of air barrier system for the following warranty period:
  1. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS, GENERAL

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

#### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 283, ASTM E 783 or ASTM E 2357.

#### 2.3 SELF-ADHERING SHEET AIR BARRIER

- A. Aluminum-Faced Modified Bituminous Sheet: 40-mil-thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil-thick, cross-laminated polyethylene film faced with aluminum foil, with release liner on adhesive side.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle Coatings & Waterproofing Inc.; Fire Resist-705FR-A.
    - b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Perm-A-Barrier Aluminum Wall Membrane.
    - c. Henry Company; Metal Clad.

2. Physical and Performance Properties:
  - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
  - b. Tensile Strength: Minimum 250 psi; ASTM D 412, Die C.
  - c. Ultimate Elongation: Minimum 80 percent; ASTM D 412, Die C.
  - d. Puncture Resistance: Minimum 40 lbf; ASTM E 154/E 154M.
  - e. Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 70 deg F; ASTM D 570.
  - f. Vapor Permeance: Maximum 0.05 perm); ASTM E 96/E 96M, Desiccant Method.
  - g. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541 as modified by ABAA.
  - h. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
  - i. UV Resistance: Can be exposed to sunlight for 120 days according to manufacturer's written instructions.

#### 2.4 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier membrane.
- B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.
- C. Termination Sealant: Dow Corning, Dow 758 Sealant, or manufacturer's approved silicone sealant for adhering to polyethylene facer.
- D. Liquid Membrane: Air barrier manufacturer's two component liquid membrane.
- E. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- F. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- G. Sprayed Foam Sealant: Refer to Division 07 Section "Thermal Insulation" for spray foam insulation applied at doors and windows.
- H. Membrane Strip Flashing: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Coatings & Waterproofing Inc.; CCW-705.
    - b. Grace, W. R., & Co. - Conn.; Perm-A-Barrier Wall Flashing.
    - c. Henry Company; Blueskin® TWF.
  - I. Expansion/Seismic Joint: Provide Elastomeric Flashing Sheet; ASTM D 2000, minimum 50- to 65-mil- thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.

- J. Termination Bars: 1 inch wide bars used to terminate and seal the top edge of wall flashings in the following material:
  - 1. Stainless steel; .075 inch thick by 8 foot lengths. Prefabricated holes are 8 inches on center.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
  - 1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
- D. At changes in substrate plane, apply liquid membrane fillets at sharp corners and edges to form a smooth transition from one plane to another.
- E. Cover gaps in substrate plane greater than 1/2 inch and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

#### 3.3 INSTALLATION

- A. General: Install modified bituminous sheets and accessory materials according to air-barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.
  - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.

- B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
  - 1. Install membrane strip flashing centered over vertical inside corners. Install 3/4-inch fillets of termination sealant on horizontal inside corners.
- C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination sealant and according to ASTM D 6135.
- D. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
  - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
  - 1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
  - 2. Roll sheets firmly to enhance adhesion to substrate.
- F. Apply continuous modified bituminous sheets over membrane strip flashing bridging substrate cracks, construction, and contraction joints.
- G. Seal top of through-wall flashings to air-barrier sheet with a termination bar strip.
- H. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with sealant.
- I. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
  - 1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
  - 2. Install membrane strip flashing on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
- J. Connect and seal exterior wall air-barrier membrane continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- K. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply membrane strip flashing so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
  - 1. Membrane Strip Flashing: Roll firmly to enhance adhesion.

- L. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier membrane with foam sealant.
- M. At end of each working day, seal top edge of air-barrier material to substrate with termination sealant.
- N. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- O. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.
- P. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- Q. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

### 3.4 FIELD QUALITY CONTROL

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

- D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

### 3.5 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
  - 1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
  - 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 072713

SECTION 074213.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concealed-fastener, lap-seam metal wall panels and mechanical screening panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings:

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

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.

1. Include Samples of trim and accessories involving color selection.

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

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

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

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

1.8 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:
  - a. Structural failures including rupturing, cracking, or puncturing.
  - b. Deterioration of metals and other materials beyond normal weathering.



2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Wind Loads: As indicated on Drawings.
  2. Deflection Limits: For wind loads, no greater than [1/180] [1/240] <Insert deflection> of the span.
  3. <Insert serviceability requirements>.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile, Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone UC-500 Flush Panel System or comparable product by one of the following:
    - a. ATAS International, Inc.;
    - b. Berridge Manufacturing Company;
    - c. Centria;

- d. Fabral;
  - e. Metecno-Morin;
2. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ55 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
- a. Nominal Thickness: 22 gage.
  - b. Exterior Finish: Two-coat fluoropolymer.
3. Panel Coverage: 12 inches.
4. Panel Height: 1.0 inch.

### 2.3 MECHANICAL SCREENING PANELS

- A. Match metal wall panels with Optional Venting Pattern.

### 2.4 FIELD-INSTALLED THERMAL INSULATION

- A. Extruded Polystyrene Board, Type X: ASTM C 578, Type X, 15-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Chemical Company (The).
    - b. Owens Corning.
  - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
  - 3. R-Value: 5.0 per inch.

### 2.5 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Hat-Shaped, Rigid Furring Channels:
  - 1. Nominal Thickness: 18 gage.
  - 2. Depth: 7/8 inch.
- C. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, and depth required to fit insulation thickness indicated.

1. Nominal Thickness: Minimum 18 gage or as required to meet performance requirements of wall panel system.
- D. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

## 2.6 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
  2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.7 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - 3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
  - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.8 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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 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.
- C. Steel Panels and Accessories:
  - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
    - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

#### 3.3 THERMAL INSULATION INSTALLATION

- A. Board Insulation: Extend insulation in thickness indicated to cover entire wall. Comply with installation requirements in Division 07 Section "Thermal Insulation."
  1. Erect insulation horizontally and hold in place with Z-shaped furring members spaced 24 inches o.c. Attach furring members to substrate with screws spaced 24 inches o.c.

#### 3.4 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
  2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  3. Install screw fasteners in predrilled holes.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Install flashing and trim as metal panel work proceeds.
  6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
  2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
  3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
  4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
  5. Flash and seal panels with weather closures at perimeter of all openings.
- E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### 3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.13





SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered ethylene-propylene-diene-monomer (EPDM) roofing system.
2. Vapor retarder.
3. Roof insulation.
4. Walkway pads.

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

1. Roof drains furnished under Division 22 Section "Plumbing".

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

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

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

- B. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, 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. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
  1. Base flashings and membrane terminations.
  2. Tapered insulation, including slopes.
  3. Roof plan showing orientation of steel roof deck and orientation of roofing and fastening spacings and patterns for mechanically fastened roofing.
  4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
  5. Fascia system.
- C. Samples for Verification: For the following products:
  1. Sheet roofing, of color required.
  2. Roof paver in each color and texture required.
  3. Walkway pads or rolls, of color required.
  4. Fascia system.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer's installation rating of the roofing contractor.
- C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of complying with performance requirements.
- D. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- E. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
- F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.
- G. Sample Warranties: For manufacturer's special warranties.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.
- B. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product. Contractor shall have installed a minimum of 500,000 square feet and have a manufacturer's installation rating of 9.0 or better.
  1. Work associated with single-ply membrane roofing, including (but not limited to) insulation, flashing, and membrane sheet joint sealers, shall be performed by Installer of this Work.
- C. Upon completion of the installation, an inspection shall be made by the system manufacturer to ascertain that the roofing system has been installed according to the applicable manufacturer's specifications and details. No "early bird" warranty will be accepted. The results of the warranty inspection shall be submitted in writing to Owner for their review and records.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

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

#### 1.9 FIELD CONDITIONS

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

#### 1.10 WARRANTY

- A. A manufacturer's sole source 20-year written Total Roofing System Warranty shall be provided with a peak gust wind speed limitation of 90 mph (measured 30 feet above the ground). Warranty shall cover both labor and materials with no dollar limitation and shall state that the Total roofing System will remain in a watertight condition. The contractor shall provide as part of the shop drawing submittal process, certification indicating that the manufacturer has reviewed and has agreed to such wind coverage indicated.
  - 1. Total Roofing System is defined as the following materials and provided by the roof system manufacturer: membrane, flashings, counterflashings, adhesives, sealants, insulation, cover boards, fasteners, fastener plates, fastener bars, metal work.
  - 2. The warranty shall be for twenty (20) years starting after final acceptance of the total roofing system by the roof system manufacturer. Defective materials or installation shall be removed, properly disposed of, and replaced at the manufacturer's expense.
  - 3. The warranty shall provide that if within the warranty period the roofing system becomes non-watertight or if the elastomeric sheet splits, tears, or separates at the seams because of defective materials and/or materials and cost thereof shall be the responsibility of the manufacturer. Should the manufacturer or his approve applicator fail to perform repairs within 72 hours of notification, the warranty will not be voided because of work being performed by others to repair the roofing regardless of the manufacturer's warranty to the contrary.
  - 4. The total Roofing System shall be applied by a roofing Contractor approved by the system manufacturer. After inspection and acceptance of the installed roof system, the warranty will be issued.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed 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. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
  2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by 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 wind speed of 90 mph (measured 30 feet above the ground).
- D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class C; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

## 2.2 EPDM ROOFING

- A. EPDM: ASTM D 4637, Type I, nonreinforced, uniform, flexible EPDM sheet.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle SynTec Incorporated.
    - b. Firestone Building Products.
    - c. Johns Manville.
    - d. Versico Incorporated.
  2. Thickness: 60 mils, nominal.
  3. Exposed Face Color: Black.

## 2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
1. 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. Contact Adhesive: 80 g/L.

- f. Other Adhesives: 250 g/L.
  - g. Single-Ply Roof Membrane Sealants: 250 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: 60-mil-thick EPDM, partially cured or cured, according to application.
  - C. Protection Sheet: Epichlorohydrin or neoprene nonreinforced flexible sheet, 55- to 60-mil-thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
  - D. Bonding Adhesive: Manufacturer's standard, State of Maine VOC Compliant.
  - E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch-wide minimum, butyl splice tape with release film.
  - F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
  - G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
  - H. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
  - I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.
  - J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

## 2.4 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by EPDM roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
  - 1. Thickness: Two layers of 3 inch thick insulation, providing a total in place thickness of 6 inches, unless indicated otherwise.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches 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.

## 2.5 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: 1/2 inch thick, high-density polyiso insulation panel designed for use as cover board.
  - 1. Compressive Strength: 100 psi.
  - 2. R-Value: 2.5.
  - 3. Density: 4 lbs/pcf.
- D. 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.

## 2.6 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

## 2.7 ROOF DRAINS

- A. Roofing contractor to supply and install pressure-treated wood blocking as required for roof drains.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
  - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- 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.

3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. 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.

3.4 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. 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 or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches 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 with insulation.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Loosely Laid Insulation: Loosely lay insulation units over substrate.
- 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 in each direction. Loosely butt cover boards together and fasten to roof deck.



1. Fasten cover boards according to requirements of manufacturer for specified warranty and performance.

### 3.5 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.
- H. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- I. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.

### 3.6 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- E. Terminate and seal top of sheet flashings.

3.7 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 ROOF DRAIN INSTALLATION

- A. Install roof drain and accessories in strict accordance with manufacturer's written instructions, providing a permanent weather tight installation.
  - 1. Inspect and determine substrate to be in satisfactory condition, with deck fully anchored and aligned at proper location and elevation. All surfaces shall be smooth, dry, clean, free of sharp edges, and other irregularities.
  - 2. Attach deck flange securely to substrate.
  - 3. Assemble and flash gravel stop flange into roof system per roof system and roof drain manufacturer requirements.
  - 4. Securely attach strainer basket.

3.9 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
  - 1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.
- B. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does 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.

END OF SECTION 075323

## SECTION 075563 - GREEN ROOFING SYSTEM

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Furnish all labor, materials, tools, and equipment to furnish and install green roof system including modules, growth media and plant species, as shown on the Drawings.

#### 1.2 SYSTEM DESCRIPTION

- A. Provide a Green Roofing System consisting of protection/drainage layer with adhered filter sheet over the waterproof membrane. Rockwool Insulation layer for water storage/plant health. 2.5" of growth media installed allowing for 15% compaction by volume. Pre-vegetated Sedum Mats (by Sempergreen) installed for instant plant coverage.

#### 1.3 SUBMITTALS

- A. Product Data: Provide product data for all materials used in system.
- B. Shop Drawings: Provide installation plan indicating planting areas, details of system components, including edging and planting layout.
- C. Submit a maintenance plan until green roof acceptance and recommendations for maintenance under Owner's care.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of system required for this Project.
- B. Source Limitations: The green roof components and growth media will be purchased from same manufacturer.
- C. Before installation, the roof shall be inspected by a technical representative of the roofing installer/manufacturer to determine the adequacy of the roof surface to accept the green roof system.
- D. It shall be the Owner's responsibility to determine the adequacy of the roof to support the existing and proposed loads. An Engineer's report will be provided to verify roof loading design. Verification of the integrity of the roof for water tightness (water test) shall also be the responsibility of the Owner.
- E. Upon completion of the installation, an inspection shall be conducted by a Technical Representative to ascertain that the system has been installed according to these specifications and details. This inspection is not intended to be a final inspection for the benefit of the owner but for the benefit of determining whether a warranty shall be issued.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate planting shipment, delivery and installation of planted within a 24-hour period from the time the plants are shipped.
- B. Maintain the health of the plants prior to installation by providing water and protection from wind, as required ensuring plant survival.

1.6 PROJECT CONDITIONS

- A. Perform installation only after appropriate roofing/membrane system has been installed and/or inspected.
- B. Restrict traffic from work areas until system is installed. Erect signs and barriers as required.
- C. Provide hoses, etc. for temporary irrigation as needed for plant maintenance until roof system acceptance.

1.7 WARRANTY

- A. Provide manufacturer's standard warranty on workmanship, material components, and vegetation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide systems by the following:
  - 1. Apex Green Roofs; 17 Parker Street, Newbury, MA (617-629-2739)

2.2 GREEN ROOF SYSTEM COMPONENTS

- A. Protection/Drainage Layer: Provide Colbond Enkadrain 3811R protection/drainage layer.
- B. Mineral Wool Insulation Layer: Provide Rockwool insulation layer.
- C. Growth Media: Provide FLL approved Growth Media (2.5").
- D. Perforated Aluminum Edge" Provide aluminum edging designed to be anchored under and over the vegetation carrier.
- E. Vegetation: Provide pre-vegetated Sedum Mats (by Sempergreen).
- F. Stone: Decorative river stone as selected by the Architect.

## PART 3 - EXECUTION

### 3.1 INSTALLATION SEASON

- A. Unless otherwise permitted, module installation shall be done between April 1 and October 15, but not when the weather is below 50° F.

### 3.2 SITE PREPARATION

- A. Areas to have system installed shall have an installed roofing system, with smooth free draining and an even surface.
- B. The area shall be thoroughly cleaned of debris that might interfere with laying of the system.
- C. Examine finish surfaces, grades, and roof quality. Do not start module installation work until unsatisfactory conditions are corrected.

### 3.3 GREEN ROOF SYSTEM INSTALLATION

- A. Install system components and accessories as recommended by the manufacturer.
- B. Install edging as indicated on the drawings.
- C. After installing system, all shall be watered sufficiently with a fine spray to insure growth. Water shall be free of substances harmful to plant growth. Hoses or other methods of transportation shall be furnished by the Contractor.

### 3.4 MAINTENANCE

- A. Provide two years of maintenance, consisting of 4 visits/year during the 2 year establishment period. Apex Green Roofs warrants a minimum plant coverage of 80%. The scope of work includes cleaning debris off roof surface, inspection of proper drainage, repairing/replacing green roof elements under contract, removal of invasive plant species, dividing plants to fill bare areas, hand watering and fertilizing for plant specific needs.

### 3.5 ACCEPTANCE

- A. Inspection to determine acceptance of system will be made by the Owner, upon Contractor's request. Provide notification at least 7 working days before requested inspection date.
  - 1. Green Roof system will be acceptable, provided all requirements, including maintenance period, have been complied with, and healthy, even colored viable plants are established.
- B. Upon acceptance, the Owner will assume module/plant maintenance.

3.6 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from installation operations.

END OF SECTION 075563

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formed low-slope roof sheet metal fabrications.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.

1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

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

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

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

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

3. Include identification of material, thickness, weight, and finish for each item and location in Project.
  4. Include details for forming, including profiles, shapes, seams, and dimensions.
  5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  6. Include details of termination points and assemblies.
  7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
  8. Include details of special conditions.
  9. Include details of connections to adjoining work.
  10. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish.
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
  2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
  3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
  4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.



1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Surface: Smooth, flat.
  - 2. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply

coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

### 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
  1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
  2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
  1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
  2. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 2. Obtain field measurements for accurate fit before shop fabrication.
  - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- H. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.
  - 1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
  - 2. Fabricate from the Following Materials:
    - a. Aluminum-Zinc Alloy-Coated Steel: 24 gage thick.
  
- B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
  - 1. Coping Profile: Fig 3-4A according to SMACNA's "Architectural Sheet Metal Manual."
  - 2. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
  - 3. Fabricate from the Following Materials:
    - a. Aluminum-Zinc Alloy-Coated Steel: 24 gage thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
  
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

### 3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5. Torch cutting of sheet metal flashing and trim is not permitted.
  6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

### 3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
  1. Interlock exterior and interior bottom edges of coping with continuous cleat anchored to substrate at 24-inch centers.

### 3.5 ERECTION TOLERANCES

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

### 3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof hatches.

1.2 SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

D. Sample Warranties: For manufacturer's special warranties.

E. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with thermally broken lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

1. Basis-of-Design Manufacturers and Products:
  - a. Bilco: Similar to Type F-50-TB.
- B. Type and Size: Single-leaf lid, custom sized 48 by 48 inches.
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Aluminum sheet.
  1. Thickness: Manufacturer's standard thickness for hatch size indicated.
  2. Finish: Factory powder coat paint finish.
- E. Construction:
  1. Insulation: Cellulosic-fiber board, glass-fiber board or polyisocyanurate board. R-Value, minimum 18.
  2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
  3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
  4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
  5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
  6. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
  7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is constant. Equip hatch with water diverter or cricket on side that obstructs water flow.
- F. Hardware: Spring operators, hold-open arm, galvanized-steel spring latch with turn handles, galvanized-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
  1. Provide two-point latch on lids larger than 84 inches.
  2. Provide remote-control operation.
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and OSHA Standards Nos. 1910.23 and 1926.500 – 1926.503.
  1. Height: 42 inches above finished roof deck.
  2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
  3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
  4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
  5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
  6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.



7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Manufacturer's standard.
  - a. Color: As selected by Architect from manufacturer's full range.

### 2.3 METAL MATERIALS

- A. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
  1. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- C. Steel Tube: ASTM A 500/A 500M, round tube.
- D. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- E. Steel Pipe: ASTM A 53/A 53M, galvanized.

### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

### 2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
  - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
  - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
  - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
  - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
  
- B. Roof-Hatch Installation:
  - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
  - 2. Attach safety railing system to roof-hatch curb.
  - 3. Attach ladder-assist post according to manufacturer's written instructions.

3.2 REPAIR AND CLEANING

- A. Touch up factory-finished surfaces with compatible paint ready for field painting.
  
- B. Clean exposed surfaces according to manufacturer's written instructions.
  
- C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078100 - INTUMESCENT FIRE RESISTIVE MATERIAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification covers labor, materials, equipment, and application necessary for, and incidental to, the complete and proper installation of intumescent fire protection for application to steel structures and supports in accordance with all applicable requirements of contract documents

1.2 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's specifications, including independent laboratory physical property test reports and certifications as may be required to show material compliance with contract documents.

1.3 QUALITY ASSURANCE

- A. Comply with ASTM E2924 for the testing, labeling, transportation, delivery, storage, shelf life, application and inspection of intumescent coatings.
- B. Manufacturer - Company specializing in manufacturing fire protection products.
- C. The intumescent fire resistive material shall be manufactured under the Follow-Up Service program of UL or ULC and bear the UL and/or ULC label (mark).
- D. Applicator - A firm with expertise in the installation of fire resistive or similar materials.
- E. Product - The product shall be approved by the architect and applicable authorities having jurisdiction.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data. Packaged materials shall bear the appropriate labels, seals and UL label (mark) for fire resistive ratings and shall be stored at temperatures in compliance with manufacturer instructions in a dry interior location away from direct sunlight.

PART 2 - PRODUCTS

2.1 EXPOSED THIN-FILM MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS (MIFRC)

- A. Exterior Use Conditions: Coatings for exterior use or interior use where exterior environmental conditions exist.
  - 1. Albi Manufacturing, Division of StanChem Inc.; Albi Clad 800.
  - 2. CAFCO : SprayFilm® WB4™.
  - 3. Carboline Co, a subsidiary of RPM International, Fireproofing Products Div.; Nullifire S607 and Topseal.
  - 4. International Paint, LLC; Interchar 212 with topcoat.
  - 5. NuChem Inc.; Thermo-Lag 3000 with topcoat.
- B. Thin-Film Mastic and Intumescent Fire-Resistive Coating: Factory-mixed formulation.
  - 1. Approved by manufacturer and authorities having jurisdiction for interior or exterior use.
  - 2. Multicomponent system consisting of primer, intumescent base coat and topcoat.
  - 3. Systems shall comply with applicable VOC requirements and meet OTC emission regulations.
- C. Color and Gloss: As indicated by manufacturer's designations.
  - 1. If additional painted topcoats are required, comply with manufacturer's requirements and coordinate with Section 099000 - PAINTING AND COATING.

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
  - 1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory," for coating materials based on a series of bond tests per ASTM E 736.
  - 2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of sprayed fire-resistive material per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material.
- D. Reinforcing Fabric for Use with Intumescent Coatings: Glass-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated, approved by manufacturer of thin-film mastic and intumescent coating fire-resistive material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
  - 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
  - 2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
  - 3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  - 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
- B. Verify that concrete work on steel deck has been completed.
- C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are completed.
- D. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.
- C. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION, GENERAL

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

- B. Apply sprayed fire-resistive material that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Coat substrates with bonding adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by sprayed fire-resistive material manufacturer for material and application indicated.
- D. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by sprayed fire-resistive material manufacturer, install body of fire-resistive covering in a single course.
- E. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by sprayed fire-resistive material manufacturer.
- F. Where sealers are used, apply products that are tinted to differentiate them from sprayed fire-resistive material over which they are applied.

### 3.4 APPLICATION, EXPOSED MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Apply exposed thin-film mastic and intumescent fire-resistive coatings in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition.
- B. Apply mastic and intumescent fire-resistive coating as follows:
  - 1. Install reinforcing fabric as required to obtain designated fire-resistance rating and where indicated.
  - 2. Finish: Even, spray-textured finish produced by lightly rolling flat surfaces of fire-protected members before fire-resistive material dries, to smooth out surface irregularities and to seal in surface fibers.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
  - 1. Cooperate with testing agency, provide access.
- B. Remove and replace applications of sprayed fire-resistive material that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.
- C. Apply additional sprayed fire-resistive material, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.
- D. Field inspect intumescent materials in accordance with AWCI Tech Manual 12B.

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### 3.6 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect sprayed fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- C. Coordinate application of sprayed fire-resistive material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect sprayed fire-resistive material and patch any damaged or removed areas.
- D. Repair or replace work that has not successfully protected steel.

END OF SECTION 078100





SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product proposed. Include product characteristics, typical uses, performance and limitation criteria, test data, and installation instructions.

B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition required.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Provide a list of at least 3 completed projects and name and contact information for installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A person experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Preinstallation Conference: Conduct conference at Project site.
- C. Special Inspections: Allow for 1 of each type of firestopping system to be removed and inspected for conformance with approved submittals. All firestopping shall be inspected prior to the installation of ceilings.
- D. Above Ceiling review: Prior to the installation of ceilings, a review of construction completion shall be conducted for firestopping and other items that will not be visible when the ceilings have been installed.

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
  - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
    - 1) UL in its "Fire Resistance Directory."
    - 2) Intertek Group in its "Directory of Listed Building Products."
    - 3) FM Global in its "Building Materials Approval Guide."

## 2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. A/D Fire Protection Systems Inc.
    - c. Hilti, Inc.
    - d. RectorSeal.
    - e. Specified Technologies, Inc.
    - f. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
  2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
  3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
1. For fire-resistive joint systems exposed to view in public spaces upon completion of Work, provide products that are paintable.
    - a. Mechanical, electrical and elevator machine rooms are not considered public spaces.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
  2. Substrate primers.
  3. Collars.
  4. Steel sleeves.

### 2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant

additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

## 2.4 MIXING

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

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

### 3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Electrical and Telecommunication Boxes: Provide putty pads for all electrical outlet boxes in fire rated exterior walls and bedroom/dorm room party walls.
  - 1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.
  - 2. Provide putty pads for all electrical outlet boxes in fire rated exterior walls and bedroom/dorm room party walls.

### 3.4 IDENTIFICATION

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

### 3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

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- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.
- D. Reinstall firestopping materials that have been removed for inspection.

### 3.6 CLEANING AND PROTECTION

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

END OF SECTION 078413





SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product proposed for use. List product characteristics, typical uses, performance and limitation criteria, test data, and installation instructions.
- B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
- C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
  1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Preinstallation Conference: Conduct conference at Project site.
- C. Special Inspections: Allow for 1 of each type of joint firestopping system to be removed and inspected for conformance with approved submittals.
- D. Above Ceiling review: Prior to the installation of ceilings, a review of construction completion shall be conducted for joint firestopping and other items that will not be visible when the ceilings have been installed.

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

- 1) UL in its "Fire Resistance Directory."

## 2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. A/D Fire Protection Systems Inc.
    - c. W.R. Grace & Co., Construction Products Division.
    - d. Hilti, Inc.
    - e. Nelson Firestop; a brand of Emerson Industrial Automation.
    - f. RectorSeal.
    - g. Specified Technologies, Inc.
    - h. Tremco, Inc.
    - i. United States Gypsum Company.
  2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. A/D Fire Protection Systems Inc.
    - c. W.R. Grace & Co., Construction Products Division.
    - d. Hilti, Inc.
    - e. Nelson Firestop; a brand of Emerson Industrial Automation.
    - f. RectorSeal.
    - g. Specified Technologies, Inc.
    - h. Tremco, Inc.
  2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. 3M Fire Protection Products.
  - b. A/D Fire Protection Systems Inc.
  - c. W.R. Grace & Co., Construction Products Division.
  - d. Hilti, Inc.
  - e. Nelson Firestop; a brand of Emerson Industrial Automation.
  - f. RectorSeal.
  - g. Specified Technologies, Inc.
  - h. Tremco, Inc.
2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures. Provide systems with L-rating where walls and partitions also are smoke barriers. Where a fire-resistive joint system is not available with the ability to resist smoke, provide smoke sealant material to one side of wall to stop the passage of smoke.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
1. For fire-resistive joint systems exposed to view in public spaces upon completion of Work, provide products that are paintable.
    - a. Mechanical, electrical and elevator machine rooms are not considered public spaces.
- F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

- A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
  2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

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

### 3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Before installation of ceilings, walls, and adjacent construction that would conceal fire-resistive joint systems, inspect joints to verify complete installation of fire-resistive joint systems materials.
- C. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- D. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.
- E. Reinstall firestopping materials that have been removed for inspection.

3.5 CLEANING AND PROTECTION

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

3.6 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under product category Firestop Systems.
- C. Wall-to-Wall, Joint Firestopping Systems:
  - 1. UL-Classified Systems: Provide one of the following as applicable:
    - a. WW-S-0017. (CMU – exposure on side)
    - b. WW-D-0027. (CMU – both sides)
    - c. WW-D-0083. (Drywall to CMU – both sides)
    - d. WW-D-0084. (Shaft wall to CMU – both sides)
- D. Head-of-Wall, Fire-Resistive Joint Firestopping Systems:
  - 1. UL-Classified Systems: Provide one of the following as applicable:
    - a. HW-D-0060. (firetrack at deck – perpendicular or parrallel)
    - b. HW-D-0099. (fireproofing at deck - parallel)
    - c. HW-D-0119. (shaftwall firetrack at deck – perpendicular or parrallel)
    - d. HW-D-0252. (fireproofing at beam - parallel)
    - e. HW-D-0365. (metal deck – parallel)
    - f. HW-D-0456. (metal deck – parallel)
    - g. HW-D-0548. (metal deck – perpendicular, stud and shaftwall)
- E. Bottom-of-Wall, Joint Firestopping Systems:
  - 1. UL-Classified Systems: Provide one of the following as applicable:
    - a. BW-S-0003. (stud wall)
    - b. BW-S-0020. (shaftwall)

END OF SECTION 078443

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Silicone joint sealants.
  - 2. Mildew-resistant joint sealants.
  - 3. Latex joint sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
  - 1. Joint-sealant location and designation.
  - 2. Manufacturer and product name.
  - 3. Type of substrate material.
  - 4. Proposed test.
  - 5. Number of samples required.
- D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- F. Field-Adhesion-Test Reports: For each sealant application tested.
- G. Sample Warranties: For special warranties.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

#### 1.5 FIELD CONDITIONS

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

#### 1.6 WARRANTY

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



PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Sealant Type 1: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
  - 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. Dow Corning Corporation; 790; 756 SMS for cold applications.
    - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    - c. Pecora Corporation; 890.
    - d. Sika Corporation, Construction Products Division; SikaSil-C990.
    - e. Tremco Incorporated; Spectrem 1.
- B. Sealant Type 2: Not Used.
- C. Sealant Type 3: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
  - 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. Pecora Corporation; 301 NS (VOC 50).
    - b. Tremco Incorporated; Spectrem 800 (VOC 1).
- D. Sealant Type 4: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dow Corning Corporation; 786(VOC 33) (Food)
    - b. GE Advanced Materials - Silicones; Sanitary SCS1700.
    - c. Tremco Incorporated; Tremsil 200 Sanitary (VOC 1).

2.3 LATEX JOINT SEALANTS

- A. Sealant Type 5: Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  - 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 Building Systems; Sonolac (VOC 41).
    - b. Bostik, Inc.; Chem-Calk 600.
    - c. Pecora Corporation; AC-20 (VOC 31).
    - d. Sherwin-Williams 950A
    - e. Tremco Incorporated; Tremflex 834.

2.4 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

### 3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without

deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.6 JOINT-SEALANT SCHEDULE

- A. Exterior Isolation and Contraction Joints in Cast-in-place Concrete Slabs or Joints in Stone Paving Units.
  - 1. Silicone Joint Sealant: Sealant Type 3.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Exterior Control, Expansion, and Soft Joints in Masonry and Between Masonry and Adjacent Work.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Exterior Control, Expansion, and Soft Joints Between Masonry and Metal Door Frames, Windows, and Storefronts.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Under Exterior Door Thresholds.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Exterior Joints for Which No Other Sealant Type is Indicated.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Interior Isolation and Contraction Joints in Cast-In-Place Concrete Slabs.
  - 1. Silicone Joint Sealant: Sealant Type 3.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Concealed Interior Perimeter Joints of Exterior Openings.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- H. Exposed Interior Perimeter Joints of Exterior Openings.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- I. Perimeter Joints Between Interior Wall Surfaces and Frames of Interior Doors Windows and Elevator Entrances.

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1. Latex Joint Sealant: Sealant Type 5.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- J. Vertical Joints on Exposed Surfaces of Interior Unit Masonry Walls and Partitions.
1. Latex Joint Sealant: Sealant Type 5.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- K. Joints between Plumbing Fixtures and Walls and Floors and Between Countertops and Walls.
1. Silicone Joint Sealant: Sealant Type 4.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- L. Interior Joints for Which No Other Sealant is Indicated.
1. Latex Joint Sealant: Sealant Type 5.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
  - 2. Review tie-in to air barrier system.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

C. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.

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

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Standard Steel Doors and Frames:



- a. Ceco Door Products; an Assa Abloy Group company.
  - b. Curries Company.
  - c. J/R Metal Frames Manufacturing, Inc.
  - d. Steelcraft; a division of Ingersoll-Rand.
2. Fire Rated Steel Frames without Backbend:
- a. Ceco Door Products; a United Dominion Company.
  - b. Curries Company.
  - c. Rediframe; a division of Dunbarton Corporation.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Smoke- and Draft-Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

## 2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
1. Full hinge cut-outs for non-handed doors will not be acceptable.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B.
1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches.
    - c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
    - d. Edge Construction: Model 2, Seamless.
    - e. Edge Bevel: Bevel lock edge 1/8 inch in 2 inches.
    - f. Core: Manufacturer's standard.
    - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener or laminated mineral board core for fire-rated doors.

2. Frames:

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- a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
  - b. Construction: Face welded.
3. Exposed Finish: Prime.

### 2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B.

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches.
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A60 coating.
- d. Edge Construction: Model 2, Seamless.
- e. Edge Bevel: Bevel lock edge 1/8 inch in 2 inches.
- f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- h. Core: Manufacturer's polyurethane core.
- i. Fire-Rated Core: Manufacturer's standard vertical steel stiffener with insulation or laminated mineral board core for fire-rated doors.

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
- b. Construction: Face welded.

3. Exposed Finish: Prime.

### 2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

3. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
  4. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

## 2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 metallic coating.
1. Wipe Coat Galvanneal materials will not be considered acceptable.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."
- H. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.7 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  - 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
  - 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

## 2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
- C. Field apply bituminous coating to backs of frames that will be filled with grout or located in exterior walls.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  - 2. Fire-Rated Openings: Install frames according to NFPA 80.
  - 3. Floor Anchors: Secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 4. Solidly pack mineral-fiber insulation inside frames.
  - 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
  - 6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  - 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 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 faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.
3. Factory glazing of wood doors.

B. Related Requirements:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.
2. Section 099123 "Interior Painting" for field finishing doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction[, **louvers,**] and trim for openings. Include factory-finishing specifications.

- B. 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. Fire-protection ratings for fire-rated 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 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. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Flush Wood Doors:
    - a. Algoma Hardwoods Inc.
    - b. Eggers Industries.
    - c. Graham Wood Doors; an Assa Abloy Group company.
    - d. Marshfield Door Systems, Inc..
    - e. VT Industries Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

#### 2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."



1. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Include all requirements as part of the door construction per Category “A” guidelines.”
  2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
  3. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
  5. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- E. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-2.
  2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
- F. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
    - a. Screw Withdrawal, Face: 700 lbf.
    - b. Screw Withdrawal, Edge: 400 lbf.
  2. Provide doors with structural-composite-lumber cores instead of particleboard cores for the following doors:
    - a. Doors indicated to receive exit devices.
    - b. Doors where oversized glass lites exceed more than 40 percent of the door surface area.
    - c. Doors where louvers exceed more than 40 percent of the door surface area.
- G. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as 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 per WDMA T.M.-10.

### 2.3 DOORS FOR OPAQUE FINISH

#### A. Interior Solid-Core Doors:

1. Grade: Premium.
2. Faces: Paint grade birch.
3. Exposed Vertical Edges: Any closed-grain hardwood.
4. Core: Particleboard except where structural composite lumber is required.
5. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

### 2.4 LIGHT FRAMES

#### A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

#### B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

### 2.5 FABRICATION

#### A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

#### B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
  - 1. Fabricate door and transom panels with full-width, solid-lumber meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated. Attach wood rectangular glazing beads flush with door face. Apply shims and sealant as required to set glazing.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
  - 1. Install fire-rated doors according to NFPA 80.
  - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

#### 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. 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.

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END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Access doors and frames for ceilings, unless specified elsewhere.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details material descriptions, dimensions of individual components and profiles, and finishes.
- B. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- C. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, electrical or other concealed work, and indicate in the schedule specified in "Submittals" Article.
- B. Where access doors are required for access to electrical junction boxes or panels located above non-accessible ceilings, the subcontractor installing the boxes or panels will be responsible for furnishing access doors, or relocate boxes and panels to accessible locations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Concealed Flanges and Hardware:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Access Panel Solutions, Inc.; Bauco Plus II.
  - 2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
  - 3. Locations: Ceiling.
  - 4. Door Size: 18 by 18 inches, unless noted otherwise.
  - 5. Frame Material: Extruded aluminum.

2.3 MATERIALS

- A. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113





SECTION 083213 - SLIDING ALUMINUM-FRAMED GLASS DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Aluminum Thermally Controlled multi-slide doors.

1.03 DESIGN / PERFORMANCE REQUIREMENTS

- A. Sliding Door Systems to comply with the performance requirements specified with independently certified testing results.
- B. Aluminum Thermally Controlled Multi Slide Doors:
  - 1. Test Results: Size tested 60 inches by 96 inches with weather resistant sill
    - a. Air Infiltration: ASTM E 283 when tested at 1.6 psf (25 mph), 0.15 CFM/FT<sup>2</sup>
    - b. Water Infiltration: ASTM E 547 when tested at 6.0 PSF, DP 40, No Leakage
    - c. Uniform Load Deflection: ASTM E 330 when tested at plus or minus 40.0 PSF, DP 40, 0.98 inch Positive / 0.98 inch Negative
    - d. Uniform Load Structural: ASTM E 330 when tested at plus or minus 60.0 PSF, DP 40, 0.19 inch Positive / 0.09 inch Negative
    - e. Overall Design Pressure Rating: DP 40

1.04 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- B. Shop Drawings: Include outside net frame dimensioning, direction of swing (outswing or inswing), number of panels, folding configuration of panels left or right, identify main entry swing panel, typical head, side jamb, sill and panel details and type of glazing material per vertical plan and elevations view drawings.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

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- E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- F. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking and adjustment of cable tension and periodic cleaning and maintenance of all railing and infill components

### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide complete, engineered and high quality sliding door system by a single source manufacturer with at least 7 years documented experience manufacturing folding door systems in the U.S.
- B. Installer Qualifications: Installer with documented experienced in the installation of manufacturer's sliding door systems or similar and screen system to the products specified.

### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect stored product from damage. Store products flat in dry, well ventilated area out of direct sunlight, under cover, protected from weather, moisture and excessive dryness and construction activities.

### 1.07 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.

### 1.08 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.

### 1.09 WARRANTY

- A. Manufacturer's limited warranty including; 10 years for panel and frame aluminum components, product finishes, folding system hardware, and weather stripping; 5 years for locking hardware and screens; 10 years for insulated glass against failure of the air seal and that each unit will be free from material obstruction of vision as a result of fogging or film formation on the internal surfaces.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER

- A. Acceptable Manufacturer: LaCantina Doors, which is located at: 1875 Ord Way; Oceanside, CA 92056; Toll Free Tel: 866-981-8485; Tel: 760-734-1590; Fax: 760-734- 1591; Email:[request info \(sales@lacantindoors.com\)](mailto:requestinfo@lacantindoors.com); Web:[www.lacantindoors.com](http://www.lacantindoors.com)

2.02 SLIDING ALUMINUM DOORS

A. Aluminum Thermally Controlled Multi Slide Doors:

1. Configuration: Complete sliding door system including head, side jambs, thresholds and aluminum sliding panels to sizes indicated on the Drawings.
2. Complete sliding door system including head, side jambs, thresholds and aluminum sliding panels to sizes indicated on the Drawings.
3. Non-Pocket Configurations: Complete sliding door system including head, side jambs, thresholds and aluminum sliding panels to the following sizes.
  - a. 3 Panels OXX or XXO Maximum Frame Width 23 feet 9-3/4 inches by Maximum Frame Height 12 foot 3-1/16 inches.
4. Frame and Panels: Complete folding door system including head, side jambs, thresholds and aluminum panels to sizes indicated on the Drawings.
  - a. Panel: Thermally broken, extruded aluminum stile and rail panels with standard one lite.
    - 1) Stile and Rail 2-3/4 inches.
  - b. Frame and Sill: Extruded aluminum.
    - 1) Frame width: \_\_\_\_\_ inches.
  - c. Weatherstripping: Weather seal inserted in frame and sill to provide perimeter seal, as well as between door panels. Color is dark bronze.
5. Glass: All glass to comply with safety glazing requirements of ANSI Z97.1 and CPSC 16CFR 1201.
  - a. Type: Cardinal dual glazed low-E glass.
    - 1) Insulated glass with a 3/4 inch (19 mm) overall thickness.
  - b. Glass:
    - 1) Argon Filled:
      - a) LowE180-Argon-Clear: Overall Thickness 3/4 inch, U-Factor 0.50, SHGC 0.49, VT 0.60
  - c. Glazing: Silicone bedding on exterior surfaces and glazing seal on the interior of the panel.
6. Locking Hardware and Handles: Manufacturer's standard minimal one piece handle and exterior locking hardware.
  - a. Provide with optional three point lock system available for systems 8 feet or taller with locking hardware located on the primary sliding panel.

- b. Handle Finish: (select one of the following)
    - 1) Brushed Satin Aluminum color.
    - 2) Brushed Satin Bronze color.
  - c. Provide panel handle height centered at 36 inches from bottom of panel.
7. Rolling Hardware: Manufacturer's standard rolling hardware integrated with engineered head track, side jambs and threshold frame system.
- a. Rolling Hardware:
    - 1) Stainless steel wheels.
  - b. Threshold: (select one of the following)
    - 1) Standard Self-draining Weather Resistant Sill with interior stop height options for all weather conditions.
    - 2) Flush sill.
    - 3) Ramp sill.
    - 4) ADA Compliant ramp sill.
8. Aluminum Finish: Provide same finishes on inside and outside. (select one of the following)
- a. Clear anodized
  - b. Bronze anodized.
  - c. White paint.
  - d. Two coat 70 percent Kynar finish with color as selected from manufacturer range of finishes.
  - e. Two coat 70 percent Kynar finish with custom color.
  - f. Decoral wood grain finish with color as selected.
9. Threshold Finish: (select one of the following)
- a. Clear anodized.
  - b. Bronze anodized.
10. Screen and Blind: Provide horizontal, retractable non-pleated insect and solar control screen and blind system with fingertip operation, load balancing and tensioning adjustment.
- a. Screen Mechanism: (select one of the following)
    - 1) Stand alone type.
    - 2) Concealed within frame and integrated with door system.
  - b. Operation:
    - 1) Single function for blinds up to 12 feet (3.65 m).wide and 10 feet (3.04 m) tall.

- c. Screen Mesh: Fiberglass/PVC mesh as selected from manufacturer's available selection for: (select one of the following)
  - 1) Insect protection.
  - 2) Control heat gain or loss.
  - 3) UV protection.
  - 4) Projector screen.
  
- d. Finish: (select one of the following)
  - 1) Anodized finish in manufacturer's standard color
  - 2) Anodized finish in custom color.
  - 3) Wood veneer from manufacturer's standard selections.

## 2.03 FABRICATION

- A. Sizes and Configurations: Fabricate to sizes and configurations indicated on the Drawings. Verify opening sizes by field measurement prior to completing fabrication.
- B. Verify sliding direction for opening units
- C. Fabricate with manufacturer's non-integral nail fin for use in conjunction with standard flashing, weather resistant barriers and compatible sealants.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that the maximum deflection of the header with the live load does not exceed the lesser of  $L/720$  of the span and 1/4 inch. Structural support for lateral loads including both wind load and when the panels are stacked open) must be provided.
- C. Verify that dimensions of rough opening will fit the net frame dimensions of door system; verify that rough openings are level, plumb, and square, with no unevenness in the floor.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.02 PREPARATION

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

### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

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- B. Properly flash and waterproof around the perimeter of the opening and frame. Adequate overhangs to prevent the effects of sheeting water from above are recommended.
- C. Provide adequate anchorage devices. Securely fit frame in place, level, straight, plumb and square. Install frame in proper elevation, plane and location, and in proper alignment with other work. Head section of frame must be installed with a 1/8 inch upward crown at the center of the opening.
- D. If necessary for tracks recessed into finish floors, drill weep holes in the floor track and provide drain connectors to ensure water can escape from the tracks.
- E. Ensure doors are adjusted for proper operation.
- F. For products requiring field finishing, field as specified in Section 09 90 00 - Painting and Coating; seal and finish promptly after installation and no more than seven days and prior to exposure to weather.
- G. Install the screen system following the manufacturer's recommendations and installation instructions.

### 3.04 ADJUSTING

- A. Adjust units as necessary to ensure smooth, quiet operation without warping or binding. Check and readjust operating hardware so latches engage accurately and securely without forcing or binding.

### 3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Protect installed product from construction activities, particularly thresholds and floor channels.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 083213

SECTION 083323 - OVERHEAD COILING 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. Service doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
  - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
  - 1. Include plans, elevations, sections, and mounting details.
  - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
  - 4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
  - 5. Show locations of controls, locking devices, and other accessories.
  - 6. Include diagrams for power, signal, and control wiring.
- C. Samples for Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
  - 1. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
  - 1. Obtain operators and controls from overhead coiling door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
  - 1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
  - 2. Testing: According to ASTM E 330.
  - 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
  - 4. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. wind load, acting inward and outward.
- B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Component Importance Factor: 1.0.

2.3 DOOR ASSEMBLY

- A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Series 616 by Overhead Door Corporation or comparable product by one of the following:
    - a. Cookson Company.
    - b. Cornell Iron Works, Inc.
    - c. Mahon Door Corporation.



- d. McKeon Rolling Steel Door Company, Inc.
  - e. Raynor.
  - f. Wayne-Dalton Corp.
- B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Door Curtain Material: Galvanized steel.
- D. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
- E. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.
- F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- G. Hood: Match curtain material and finish.
- 1. Shape: Round or square.
  - 2. Mounting: Face of wall.
- H. Curtain Accessories: Equip door with weatherseals astragal push/pull handles.
- I. Electric Door Operator:
- 1. Usage Classification: Light duty, up to 10 cycles per hour.
  - 2. Operator Location: Top of hood.
  - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
  - 4. Motor Exposure: Interior.
  - 5. Provide hood to enclose any exposed motor components.
  - 6. Emergency Manual Operation: Push-up type.
  - 7. Obstruction-Detection Device: Automatic photoelectric sensor.
- J. Door Finish:
- 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
  - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

#### 2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
  - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
  - 1. Galvanized Steel: Nominal 0.028-inch-thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.

2.7 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
  - 1. At door head, use 1/8-inch-thick, replaceable, continuous-sheet baffle secured to inside of hood or field- installed on the header.
  - 2. At door jambs, use replaceable, adjustable, continuous, nylon brushes.
- C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.8 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a

spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
  - 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.9 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA 70.
  - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
  - 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
  - 1. Electrical Characteristics:
    - a. Phase: Single phase.
    - b. Volts: 115 V.
    - c. Hertz: 60.

2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
  3. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
  4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

#### 2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Perform installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
  - 1. Adjust exterior doors and components to be weather-resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

END OF SECTION 083323



SECTION 083613 - SECTIONAL 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 electrically operated sectional doors.
- B. Related Sections:
  - 1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
  - 2. Division 26 Sections for electrical service and connections for powered operators and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
- B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Performance: Exterior sectional doors shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
  - 2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.
- D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283.
  - 1. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. at 15 and 25 mph.
- E. Operation Cycles: Provide sectional door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

#### 1.4 SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory. Include the following:
  - 1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
  - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
  - 1. Include similar Samples of accessories involving color selection.
- D. Delegated-Design Submittal: For sectional doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of seismic restraints.
  - 2. Summary of forces and loads on walls and jambs.
- E. Maintenance Data: For sectional doors to include in maintenance manuals.
- F. Warranties: Sample of special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain sectional doors from single source from single manufacturer.
  - 1. Obtain operators and controls from sectional door manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Standard for Sectional Doors: Fabricate sectional doors to comply with DASMA 102 unless otherwise indicated.



1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Faulty operation of hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
    - d. Delamination of exterior or interior facing materials.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121 Bus., Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 929-3667. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: [www.overheaddoor.com](http://www.overheaddoor.com). E-mail: [sales@overheaddoor.com](mailto:sales@overheaddoor.com).

2.2 GLAZED ALUMINUM OVERHEAD DOORS

- A. Glazed Aluminum Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.
  - 1. Door Assembly: Stile and rail assembly secured with 1/4 inch diameter through rods.
    - a. Size: As indicated on the Drawings.
    - b. Panel Thickness: 1-3/4 inches.
    - c. Windload Design: Provide to meet the Design/Performance requirements specified.
    - d. Center Stile Width: 2-11/16 inches.
    - e. End Stile Width: 3-5/16 inches.
    - f. Intermediate Rail Pair Width: 3-11/16 inches.
    - g. Top Rail Width: Provide stiffeners as required for width of door.
      - 1) 3-3/4 inches.
    - h. Bottom Rail Width: Provide stiffeners as required for width of door.

- 1) 3-3/4 inches.
    - i. Aluminum Panels: 0.050 inch thick, aluminum.
    - j. Stiles and Rails: 6063 - T6 aluminum.
    - k. Springs: 10,000 cycles.
    - l. Glazing:
      - 1) 1/2 inch insulated glass.
  2. Finish/Color:
    - a. Powder Coating Finish: Color as selected by Architect from manufacturer's standard colors.
  3. Hardware: Galvanized steel hinges and fixtures.
  4. Lock: Interior galvanized single unit.
  5. Weatherstripping:
    - a. Flexible bulb-type strip at bottom section.
    - b. Joint seal between sections available for additional weather resistance.
  6. Track: Provide low headroom track with springs to the rear.
  7. Ball bearing rollers with hardened steel races.
  8. Electric Openers.
- B. Controls:
1. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
    - a. Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated. Key to be provided in adjacent Knox Box.
  2. Radio-Control System: Consisting of the following:
    - a. Three-channel universal coaxial receiver to open, close, and stop door; 40 per operator for apartment occupants.
    - b. Multifunction remote control.
    - c. Retain subparagraph below if antenna is required.
    - d. Remote-antenna mounting kit.
    - e. Provide 20 remote control units programmed for the some door.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

## 221 CONGRESS STREET

- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
  - 1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
  - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
  - 3. Repair galvanized coating on tracks according to ASTM A 780.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

### 3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weathertight fit around entire perimeter.
- D. Align and adjust motors, pulleys, belts, sprockets, chains, and controls according to manufacturer's written instructions.
- E. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780.

END OF SECTION 083613



SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Exterior storefront framing.
  - 2. Exterior manual-swing entrance doors and door-frame units.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
  - 2. Review structural loading limitations.
  - 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 tie-in to air barrier system.
  - 5. Review sill flashing details and components.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.

- d. Glazing.
  - e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
- 1. Joinery, including concealed welds.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.
  - 5. Flashing and drainage.
- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

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

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration created by wind and thermal and structural movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Water penetration through fixed glazing and framing areas.
    - e. Failure of operating components.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
  - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
    - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
  - 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
    - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- E. Structural: Test according to ASTM E 330 as follows:



1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft..
  2. Entrance Doors:
    - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
    - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
  2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- J. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
  3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 56 as determined according to NFRC 500.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide indicated products by the following:
  1. Kawneer North America; an Alcoa company.
- B. Products:
  1. Exterior Aluminum-Framed Storefronts:
    - a. Kawneer: Trifab VersaGlaze 451T, with SSG vertical mullions.
  2. Exterior Doors and Entrances:
    - a. Kawneer: 190 Entrance.

## 2.3 STOREFRONT SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  1. Construction:
    - a. Exterior: Thermally broken
  2. Glazing System: Retained mechanically with gaskets on two or three sides.
  3. Glazing Plane: Front.
  4. Finish: High-performance organic finish.
  5. Fabrication Method: Field-fabricated stick system.
  6. Exterior Jambs and Head Framing: Provide manufacturer's standard extruded aluminum continuous thermal flat filler for use at jambs and head framing. This extrusion provides the necessary profile for sealing with the building air barrier system. Channel type jamb components will not be acceptable.
  7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  8. Steel Reinforcement: As required by manufacturer.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS

- A. Exterior Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
  - 1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
  - 2. Door Design: Narrow stile; 2-inch nominal width.
  - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
    - a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- B. Weather Stripping: Manufacturer's standard replaceable components.
  - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
  - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- C. Silencers: BHMA A156.16, Grade 1.
- D. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
  - 1. Color: Match structural sealant.

## 2.7 MATERIALS

- A. Sheet and Plate: ASTM B 209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
- C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
- D. Structural Profiles: ASTM B 308/B 308M.
- E. Steel Reinforcement:
  - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
  - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
  - 4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

## 2.8 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from 300 series stainless steel.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.
- E. Subsills for Exterior Storefronts: Manufacturer's standard thermally broken extruded aluminum sill flashing, color to match framing.

## 2.9 FABRICATION

- A. Form or extrude aluminum shapes before finishing.

- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing from exterior.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
  - 1. At exterior doors, provide compression weather stripping at fixed stops.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
  - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.10 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.11 HARDWARE FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- 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. Provide the following finishes:
  - 1. Weatherstripping                      Aluminum
  - 2. Threshold                                Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:

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1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
  2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

### 3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
  4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 084113





SECTION 085113 - ALUMINUM WINDOWS

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 aluminum windows for exterior locations.
- B. Related Requirements:
  - 1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
  - 3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
  - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

- C. Samples for Selection: For units with factory-applied color finishes.
  - 1. Include similar Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
  - 1. Exposed Finishes: 2 by 4 inches.
  - 2. Exposed Hardware: Full-size units.
- E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's warranties.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. Sample Installation: Before installing window units, install a mulled window sample window to demonstrate installation procedure. Install to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Coordinate the presence of Architect, Owner, window manufacturer representative, and air barrier manufacturer representative.
  - 2. Review, discuss, and coordinate the interrelationship of windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
  - 3. Review process for sealing joints in top, sides and bottom of mulled units.
  - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.
  - 6. Approval of sample is for relationship of window with air barrier installation; and aesthetic qualities of workmanship.
  - 7. Approved sample may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
    - c. Faulty operation of movable sash and hardware.
    - d. Deterioration of materials and finishes beyond normal weathering.
    - e. Failure of insulating glass.
  - 2. Warranty Period:
    - a. Window: 10 years from date of Substantial Completion.
    - b. Glazing Units: 10 years from date of Substantial Completion.
    - c. Aluminum Finish: **[10] [20]** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Quaker Commercial Windows and Doors; Modern Vu, Awning and Picture.
- B. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
  - 1. Window Certification: AMMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
  - 1. Minimum Performance Class: **[R] [LC] [CW] [AW] [As indicated on Drawings] <Insert class>**.
  - 2. Minimum Performance Grade: **[15] [20] [25] [30] [35] [40] [45] [50] [As indicated on Drawings] <Insert grade>**.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.42 Btu/sq. ft. x h x deg F.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.20.

- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of [45] [52] <Insert value>.
- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.
- G. Sound Transmission Class (STC): Rated for not less than [26] [30] <Insert rating> STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than [22] [26] [30] <Insert rating> OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

### 2.3 ALUMINUM WINDOWS

- A. Operating Types: Provide the following operating types in locations indicated on Drawings:
  - 1. Awning: Project out.
  - 2. Fixed.
- B. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
  - 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- C. Insulating-Glass Units: Energy 3S option.
  - 1. Glass: ASTM C 1036, Type 1, Class 1, q3.
    - a. Tint: Clear.
    - b. Kind: Float glass.
  - 2. Lites: Two.
  - 3. Filling: Fill space between glass lites with argon.
  - 4. Low-E Coating: As standard with Energy 3S option.
- D. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

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1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

### E. Projected Window Hardware:

1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
  - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
2. Hinges: Non-friction type, not less than two per sash.
3. Lock: Multi-point locking system.

### F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

### G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.4 INSECT SCREENS

### A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, inside for project-out sashes.

### B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

### C. Wire Fabric: Manufacturer's BetterVue screen.

## 2.5 FABRICATION

### A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

### B. Glaze aluminum windows in the factory.

### C. Weather strip each operable sash to provide weathertight installation.

### D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

- E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.
- F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
  - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

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- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113



## SECTION 087100 – FINISH HARDWARE

### PART 1 –GENERAL

#### 1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 01 General Requirements, apply to the work of this section.

#### 1.02 DESCRIPTION OF WORK

- A. The work of this section includes, but is not limited to, the following:
  - 1. Providing hardware for all doors, except doors provided with their own hardware.
  - 2. Providing lock cylinders for all work requiring cylinders.
  - 3. Providing the services of a qualified hardware consultant to prepare detailed schedules of hardware required for the project.

#### 1.03 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this section. Other specifications sections which directly relate to the work of this section include, but are not limited to, the following:
  - 1. Section 081113 – Hollow Metal Doors and Frames; work requiring template coordination, metal astragals for fire-rated doors.
  - 2. Section 081416 – Flush Wood Doors; work requiring template coordination, metal astragals for fire-rated doors.

#### 1.04 INTENT

- A. A major intent of the work of this section is to provide hardware for every door in the project, except as indicated, so that each door functions correctly for its intended use. Provide only hardware that complies with applicable codes and requirements of authorities having jurisdiction including requirements for barrier-free accessibility.

#### 1.05 QUALITY ASSURANCE

- A. Hardware supplier shall have in his employ one or more members of the Door and Hardware Institute to include at least one Certified Architectural Hardware Consultant in good standing, who shall be responsible for preparation of the Finish Hardware Schedule. This Consultant shall be acceptable to the Architect and is to ensure that the intent requirement of this specification is fulfilled, and certify that the work of this section meets or exceeds the requirements specified in this section and the requirements of authorities having jurisdiction.

- B. Hardware supplier shall warrant and guarantee, in writing, that hardware supplied is free of defective material and workmanship. Supplier shall further warrant and guarantee for a period of one year from Owner's Use and Occupancy that the hardware shall function in a satisfactory manner without binding, collapse, or dislodging of its parts, provide the installation is made to the manufacturer's recommendations.
- C. The hardware supplier shall repair or remedy, without charge, any defect of workmanship or material for which he is responsible hereunder.

#### 1.06 SUBMITTALS

##### A. Submit the following in accordance with SECTION 013300-SUBMITTAL PROCEDURES:

1. Schedule: Submit to the Architect six (6) copies of the complete hardware schedule within the fourteen (14) days after receipt of contract award. Submit therewith complete catalog cuts and descriptive data of all products specifically scheduled therein. No materials shall be ordered or templates issued until the hardware schedule has been approved by the Architect. Form and detail of hardware schedule shall be in vertical format in conformance to the door and hardware industry standards. All hardware sets shall be clearly cross-referenced to the hardware set numbers listed in the specifications.
2. Samples: If requested, submit to the Architect for approval, a complete line of samples as directed. Samples shall be plainly marked giving hardware number used in this specification, the manufacturer's numbers, types and sizes. The Architect will deliver approved samples to the project site to be stored. Samples will remain with the Architect until delivery of all hardware to the project is complete, after which time they will be turned over to the General Contractor for incorporation into the work.
3. Keying System Submission: Before cylinders are ordered, submit a complete proposed keying system for approval. This should be done after a keying meeting has been held with the owner's representative.

#### 1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of hardware shall be made to the project by the Hardware Supplier in accordance with the instructions of the General Contractor.
- B. The finish hardware shall be delivered to the jobsite and received there by the General Contractor. The General Contractor shall prepare a locked storage room with adequate shelving, for all hardware. The storage room shall be in a dry, secure area, and shall not include storage of other products by other trades.

- C. The General Contractor shall furnish the Hardware Supplier with receipts for all hardware and accessory items received, and shall send copies of these receipts to the Architect, if requested.

#### 1.08 REGULATORY REQUIREMENTS

- A. Conform to all applicable codes. Provide all throws, projections, coatings, knurling, opening and closing forces, and other special functions required by State and Local Building Codes, and all applicable Handicap Code requirements.
- B. For fire rated openings, provide hardware complying with NFPA 80 and NFPA 101 without exception. Provide only hardware tested by UL for the type and size of door installed and fire resistance rating required.

#### 1.09 SPECIAL REQUIREMENTS

- A. Hardware Supplier shall determine conditions and materials of all doors and frames for proper application of hardware.
- B. The Hardware Schedule shall list the actual product series numbers. Bidders are required to follow the manufacturers' catalog requirement for the actual size of door closers, brackets and holders. All door opening sizes are as noted on the Door Schedule and all hardware shall be in strict accordance with requirements of height, width, and thickness.

## PART 2 – PRODUCTS

## 2.01 ACCEPTABLE MANUFACTURERS

Hinges	McKinney Stanley	Scranton, PA New Britain, CT
Locksets	Sargent	New Haven, CT
Exit Devices	Sargent	New Haven, CT
Door Closers	Sargent	New Haven, CT
Electric Door Openers	Horton	Corpus Christi, TX
Door Stops	Glynn Johnson Ives Rockwood	Indianapolis, IN New Haven, CT Rockwood, PA
Push/Pulls	Rockwood Burns Ives	Rockwood, PA Erie, PA New Haven, CT
Protective Plates	Rockwood Burns Ives	Rockwood, PA Erie, PA New Haven, CT
Thresholds/ Weatherstripping/ Rain Drips/ Sound Seals	NGP Pemko Reese	Memphis, TN Memphis, TN Rosemount, MN
Silencers	Ives Glynn Johnson Rockwood	New Haven, CT Indianapolis, IN Rockwood, PA

## 2.02 MATERIALS AND QUALITY

- A. All hardware shall be of the best grade of solid metal entirely free from imperfections manufacturer and finish.
- B. Qualities, weights, and sizes given herein are the minimum that will be accepted. It is the responsibility of the Hardware Supplier to supply the specified size and weight of hardware and the proper function of hardware in each case and to provide UL approved hardware at all fire rated doors.
- C. Provide locks of one lock manufacturer and hinges of one hinge manufacturer. Modifications to hardware that are necessary to conform to construction shown or specified shall be provided as required for the specified operation and functional features.

## 2.03 HARDWARE DESIGNATIONS

- A. All items of hardware are referenced by manufacturer's names and numbers. The manufacturer's names and numbers are used to define the function, design, and the quality of the material to be supplied.

Substitution of products other than those listed shall be submitted to the Architect at least ten (10) days PRIOR to the bid date. The Architect shall be the sole judge of any proposed substitution.

## 2.04 TEMPLATES

- A. Hardware supplier shall immediately, but not later than three (3) days after approval of his Schedule by the Architect, furnish the General Contractor with complete template information necessary for the fabrication of doors, frames, etc. No templates shall be furnished prior to the approval of the hardware schedule.

## 2.05 HARDWARE FOR LABELED FIRE DOORS, EXIT DEVICES AND SMOKE DOORS

- A. Hardware shall conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Labeling and listing by UL Building Materials Directory, for class of door being used will be accepted as evidence of conformance to these requirements. Install minimum latch throw as specified on label of individual doors. Provide hardware listed by UL except where heavier materials, larger sizes, or better grades are specified herein under paragraph entitled "Hardware Sets". In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements. Specific hardware requirements of door or frame manufacturers which exceed sized or weights of hardware herein listed shall be provided with no additional charge.

## 2.06 KEYS AND KEYING

- A. The hardware supplier shall review the specific hardware functions with the Architect and owner at the time of the keying review, to assure the appropriateness of each of the hardware functions. Failure to make this review does not relieve the hardware supplier from providing the proper functions.
- B. Key System: All cylinders shall be Masterkeyed and Grandmaster Keys to the existing removable core system at exterior and selected interior cylinders.
  - 1. Master keys, Grandmaster Keys: Furnish six (6) keys for each set, if required.
  - 2. Furnish three (3) change keys for each cylinder keyed differently; six (6) change keys for each set keyed alike, and in sets where only (2) cylinders are keyed alike, four (4) change keys will be required.
  - 3. All keying is to be done at the factory to avoid duplication of the new cylinders.

4. Master Keys shall be sent to the Owner by registered mail, return receipt required.
5. Supply a bitting list for all change keys and master keys to the Owner.
6. Cylinders and keys shall be Sargent and lettered keyway by Sargent Manufacturing, New Haven, CT.
7. Master key or grand master key cylinders and key in groups, unless otherwise specified. Factory masterkey with manufacturer retaining permanent keying records.
8. Provide six (6) masterkeys for each masterkey set. Provide three (3) change keys for each lock. Provide two (2) control keys for core removal. Stamp keys "DO NOT DUPLICATE".
9. Submit proposed keying schedule to Architect. If requested, meet with Owner and Architect to review schedule.
10. Provide removable core cylinders, with patented key control and lettered keyway, for each lock with construction masterkeying. Permanent cores shall be installed upon completion of the project.

#### 2.07 FASTENERS

- A. Manufacture hardware to conform to published templates, generally prepared for machine screw installation.
- B. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish exposed screws to match the hardware finish, or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, except as otherwise indicated.
- C. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard manufactured units of the type specified are available with concealed fasteners. Do not use thru-bolts unless specifically approved by the Architect.
- D. All hardware shall be installed only with fasteners supplied by manufacturers of specific products.

#### 2.08 PACKING AND MARKING

- A. All hardware shall have the required screws, bolts and fastenings necessary for proper installation and shall be wrapped in the same package as the hardware item for which it is intended and shall match finish of hardware with which to be used.
- B. Each package shall be clearly labeled indicating the portion of the work for which it is intended.

2.09 ENVIROMENTAL CONCERN FOR PACKGING

- A. The hardware shipped to the jobsite is to be packaged in biodegradable packs such as paper or cardboard boxes and wrapping. If non-biodegradable packing such as plastic, plastic bags or large amounts of Styrofoam is utilized, then the Contractor will be responsible for the disposal of the non-biodegradable packing to a licensed or authorized collector for recycling of the non-degradable packing.

2.10 FINISH HARDWARE DESCRIPTION

- A. Hardware items shall conform to respective specifications and standards and to requirements specified herein.

B. MATERIALS AND FINISH MATERIALS AND FINISHES SHALL BE:

- 1. Butts: US26D (BHMA 652)
- 2. Interior Apartment to be black finish
- 3. Door Closers: Sprayed to match hardware finish.
- 4. Exit Devices: US26D (BHMA 626)
- 5. Kick, Push Plates: US32D (BHMA 630)
- 6. All other hardware shall be: US26D (BHMA 626), or US32D (BHMA) 630 or as indicated.

C. HINGES

- 1. Number of hinges per door, two hinges for doors up to and including five feet in height and an additional hinge for each two and one half feet or fraction thereof.
- 2. Hinges shall be as follows:

Exterior	McKinney	TA2314	4 ½ x 4 ½ NRP
	Stanley	FBB191	4 ½ x 4 ½ NRP
Interior	McKinney	TA2714	4 ½ x 4 ½
	Stanley	FBB179	4 ½ x 4 ½
Elec	McKinney	TA2714-CC4	
	Stanley	CEFBB179	

D. DOOR CLOSERS:

- 1. Door closers shall have fully hydraulic, full rack and pinion action. Cylinder body shall be 1-1/2" in diameter, and double heat treated pinion shall be 11/16" in diameter.
- 2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.

3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and hydraulic back-check.
4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
5. Closer arms (and metal covers when specified) shall have a powder coating finish.
6. Provide drop, mounting plates, where required.
7. Do not locate closers on the side of doors facing corridors, passageways or similar type areas. Where it is necessary, due to certain conditions and approval of the Architect, to have closers in corridors, provide such closers with parallel or track type arms.
8. All door closers shall be adjusted by the installer in accordance with the manufacturer's templates and written instructions. Closers with parallel arms shall have back-check features adjusted prior to installation.
9. Closers shall conform to all applicable code requirements relative to setting closing speeds for closers and maximum pressure for operating interior and exterior doors.
10. Door closers meeting this specification are as follows:

	Sargent
Exterior	281 – CPS 281 – CPSH
Interior	281- 0 281 – P10 2407 Series 281 – OT x spec. TEMP. 2980 2477

E. EXIT DEVICES:

1. Shall be Sargent as follows:

Function	Sargent
A	16-8804
B	16-8810
C	8804ET
D	8815ET



E	12-8810
F	12-8813ET
G	12-8815ET
H	8710
I	8713ET
J	8715ET
K	(Von Duprin) 33A NL-OP
L	PP/PR8713ET
M	PP/PR8715ET
N	12-8710
O	12-8713ET
P	12-8715ET
Q	12-PP/PR8710
R	12-PP/PR8713ET
S	12PP/PR8715ET
T	8710 x 306
U	56-12 8813 ETL
V	56-8804
W	56-8813-ETL
X	8813 ETL

NOTE: Lever design shall match lock trim

- F. Where removable mullions are required for pairs of doors, provide a fire rated U.L. listed channel iron mullion. Fire rated U.L. listed mullions shall be provided for all pairs of doors requiring mullions whether the door carries a fire rating or not.

On pairs of doors where removable mullions are called for, the mullions shall be UL rated for both rated and non rated doors as follows:

Sargent - 12-980  
 Von Duprin - 9954

G. LOCKSETS, LATCH SETS:

1. Mortise type shall be heavy-duty ANSI A156.13, Series 1000, Grade 1 Operational, 2-3/4" backset, six pin cylinder with lever handles.

Manufacturer	Series	Lever Design
Sargent	8200	RAS, Gramercy at Apartment Entrances
Sargent	8200	REM, Gramercy at all Others

2. Strikes shall be curved lip ANSI A - 115.2 4 7/8" x 1 1/4" wrought brass or bronze.
3. All locksets and cylinders for this project shall be masterkeyed as directed.

4. The following is a list of lock functions as indicated under "hardware set":

<u>Function</u>	<u>Sargent</u>
A	04
B	05
C	15
D	37
E	65
F	43
G	38
H	71

H. INTERIOR UNIT LATCHSETS AND PRIVACY SETS TO SCHLAGE, BROADWAY COLLECTION:

F10S	LAT at Closets
F40	LAT at Bedrooms and Bathrooms

I. ELECTRIC DOOR OPENER/CLOSER:

1. Where indicated in the hardware sets provide electric door opener/closer model 4100 w/MC25 interlock as manufactured by Horton. Unit shall be operated by Radio Frequency wireless actuators and be furnished complete with built in wireless receiver.

J. PUSH PLATES, DOOR PULLS, PUSH/PULL BARS:

1. Shall be as manufactured by Rockwood, Burns or Ives.
  - a. Push plates shall be 4" x 16" x .050 thickness unless otherwise listed in hardware sets.

Rockwood	70 Series
Burns	50 Series
Quality	40 Series
  - b. Door pulls shall be 1" x 10"  
Type A

Rockwood	BF111
Burns	BF26C
Quality	BF163-10"
  - c. Flush Pulls  
Where called for in the hardware sets provide Ives 227 or equal.
  - d. Push/Pull bars

Type A (Wide Stile Doors)

Rockwood	BF11147 x T1006 Mounting
Burns	BF26C x 442 x Sim. Mounting as Above
Quality	BF 482 x Sim. Mounting as Above

K. KICK PLATES, ARMOR PLATES, MOP PLATES:

1. Kick plates shall be 8 in. high. Armor plates shall be 34 in. high. Mop plates shall be 4 in. high. All plates shall be 2 in. less the width of door. Plates shall be .050 thickness, bevel 4 edges, screws shall be oval head counter-sunk.

L. STOPS

1. Shall be furnished at all doors. Wherever and opened door or any item of hardware thereon strikes a wall, at 90 degrees. Provide wall bumpers, unless otherwise indicated in hardware sets.
2. Where wall bumpers cannot be effectively used, a floor stop shall be furnished and installed.
3. Provide roller bumpers for each door where two doors interfere with each other in swinging.

Manufacturer	Wall Bumpers	Floor Stops	Roller Bumpers
Rockwood	409	440, 442	456
Ives	407 ½	436B, 438B	470 Series
Glynn Johnson	WB 50XT	FB13, FB14	RB-3

4. Where overhead stops are listed they shall be the surface mounted type as follows:

Manufacturer	Series
Glynn Johnson	GJ450
Sargent	1540
ABH	4400

M. THRESHOLDS, WEATHERSTIP, SEAL:

1. Thresholds shall be as detailed and furnished on all doors where shown on drawings. Thresholds shall be aluminum unless otherwise indicated. Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants".
2. Weatherstripping shall be furnished on all exterior doors unless otherwise indicated.

Product	Pemko	Reese	NGP
Threshold	as detailed		
Brush Seal	45062AP	970	A626A
Door Sweep	345AV	353	101AV

N. DOOR VIEWERS:

1. Shall be Ives U696.

O. SLIDING DOOR HARDWARE:

1. Shall be Stanley BPC150N 150 lb.

P. POCKET DOOR HARDWARE:

1. Shall be Stanley PDF 250N 250 lb.

Q. SIDEWALL SLIDING DOOR HARDWARE:

1. Shall be Pemko 280 SWT

### PART 3—EXECUTION

#### 3.01. INSPECTION

1. It shall be the general contractors' responsibility to inspect all doors openings and doors to determine that each door and door frame has been properly prepared for the required hardware. If errors in dimensions or preparation are encountered, they are to be corrected by the responsible parties prior to the installation of hardware.

#### 3.02 PREPARATION

1. All doors and frames, requiring field preparation for finish hardware, shall be carefully mortised, drilled for pilot holes, or tapped for machine screws for all items of finish hardware in accordance with the manufacturers' templates and instructions.

#### 3.03 INSTALLATION/ADJUSTMENT/LOCATION

1. All materials shall be installed in a workmanlike manner following the manufacture's recommended instructions.
2. Exit Devices shall be carefully installed so as to permit friction free operation of crossbar, touch bar, lever. Latching mechanism shall also operate freely without friction or binding.
3. Door Closers shall be installed in accordance with the manufacturer's instructions. Each door closer shall be carefully installed, on each door, at the

degree of opening indicated on the hardware schedule. Arm position shall be shown on the instruction sheets and required by the finish hardware schedule.

4. The adjustments for all door closers shall be the installer's responsibility and these adjustments shall be made at the time of installation of the door closer. The closing speed and the latching speed valves, shall be adjusted individually to provide a smooth, continuous closing action without slamming. The delayed action feature or back check valve shall also be adjusted so as to permit the correct delayed action cycle or hydraulic back check valve shall also be adjusted so as the opening cycle. All valves must be properly adjusted at the time of installation. Each door closer has adjustable spring power capable of being adjusted, in the field from size 2 thru 6. It shall be the installers' responsibility to adjust the spring power for each door closer in exact accordance with the spring power adjustment chart illustrated in the door closer installation sheet packed with each door closed.
5. Installation of all other hardware, including locksets, push-pull latches, overhead holders, door stops, plates and other items, shall be carefully coordinated with the hardware schedule and the manufacturer's instruction sheets.
6. Locations for finish hardware shall be in accordance with dimensions listed in the pamphlet "Recommended locations for Builders' Hardware" published by the Door and Hardware Institute.

#### 3.04 FIELD QUALITY CONTROL

1. Upon completion of the installation of the finish hardware, it shall be the responsibility of the finish hardware supplier to visit the project and to examine the hardware for each door on which he has provided hardware and to verify that all hardware is in proper working order. Should he find items of hardware not operating problem he should make a report, in writing, to the general contractor, advising him of the problem and the measures required to correct the problem.

#### 3.05 PROTECTION

1. All exposed portions of finish hardware shall be carefully protected, by use of cloth, adhesive backed paper or other materials, immediately after installation of the hardware item on the door. The finish shall remain protected until completion of the project. Prior to acceptance of the project by the Architect and owner, the general contractor shall remove the protective material exposing the finish hardware.

#### 3.06 CLEANING

1. It shall be the responsibility of the general contractor to clean all items of finish hardware and to remove any remaining pieces of protective materials and labels.

### 3.07 INSTRUCTIONS AND TOOLS

1. It shall be the responsibility of the finish hardware supplier to provide installation and repair manuals and adjusting tools, wrenches, etc... for the following operating products.
  - a. Locksets (all types)
  - b. Exit Devices (all types)
  - c. Door Closers

### 3.08 HARDWARE SETS

1. Each Hardware Set listed below represents the complete hardware requirements for one opening. (Single Door or Pair of Doors). Furnish the quantities required for each set for the work.

#### ITEM 1

Doors 106A, 106B

Each Door to Have: Hinges, Exit Device (Function K), Closer, Kick Plate, Weatherstrip by Aluminum Door Supplier

#### ITEM 2

Doors 106C, 106D, 106E, 103B

Each Door to Have: Hinges, Exit Device (Function B), Closer, Kick Plate, Weatherstrip, Door Bottom, Threshold

#### ITEM 3

Door 101

Door to Have: Electric Transfer Hinge, Hinges, Exit Device (Function V), Auto Door Opener, Kick Plate, Pull, Weatherstrip, Door Bottom, Threshold, Power Supply

#### ITEM 4

Door 101A

Door to Have: Electric Transfer Hinge, Hinges, Exit Device (Function U), Closer, Kick Plate, Silencers, Power Supply

#### ITEM 5

Door 103A, 001, X1B

Each Door to Have: Electric Transfer Hinge, Hinges, Lockset (Function H) Closer, Kick Plate, Silencers

#### ITEM 6

Door 004

Pair to Have: Hinges, Exit Devices (Function O), Closers, Kick Plates, Stops, Silencers

ITEM 7

Doors 005, 006, 105A, 105B

Each Door to Have: Hinges, Lockset (Function A), Closer, Kick Plate, Stop, Silencers

ITEM 8

Doors 003, 102, 102A, 003A, X1, X1A

Each Pair to Have: Hinges, Latch Set (Function C), Closer, Kick Plate, Silencers

ITEM 9

Doors X2, X2A

Each Door to Have: Hinges, Lockset (Function A), Closer, Kick Plate, Stop, Silencers

ITEM 10

Doors UO, UOA

Each Door to Have: Hinges, Lockset (Function F), Closer, Kick Plate, Stop, Gasket, Viewer

ITEM 11

Doors U1, U1A, U9

Each Door to Have: Privacy Set, Stop  
Hinges by Door/Frame Manufacturer

ITEM 12

Doors U2, U3, U3A, U3B, U3C, U9, U9A, U9B, U9C

Each Door to Have: Passage Set, Stop  
Hinges by Door/Frame Manufacturer

ITEM 13

Doors U4, U4A, U7

Each Door to Have: Sliding Door Track, Flush Pulls

ITEM 14

Door U5

Each Door to Have: Pocket Door Frame Set, Edge Pull, Flush Pull

ITEM 15

Doors U6, U6A

Each Pair to Have: Dummy Lever Sets, Roller Latches

ITEM 16

Door

Door to Have: Sidewall Door Hardware Set, Flush Pulls

ITEM 17

Door U9E, U9F, U9G

All Hardware by Door Manufacturer

END OF SECTION 087100



SECTION 088000 - GLAZING

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 for doors, storefront framing and glazed curtain walls.
  - 2. Glazing sealants and accessories.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

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

- B. Glass Samples: For each type of the following products; 12 inches square.
  - 1. Insulating glass.
- C. Glazing Accessory Samples: For colored spacers, in 12-inch lengths.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass.
- B. Product Test Reports: For insulating glass, for tests performed by a qualified testing agency.
- C. Preconstruction adhesion and compatibility test report.
- D. Sample Warranties: For special warranties.

#### 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
  - 1. Design Wind Pressures: As indicated on Drawings.
  - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.

3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
  2. For laminated-glass lites, properties are based on products of construction indicated.
  3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
  5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.2 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Glazing Manual."
  2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: 6 mm.
  2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.3 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

## 2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
  - 1. Sealing System: Dual seal, with silicone primary seal and butyl secondary seal.
  - 2. Spacer: Aluminum with mill or clear anodic finish.
  - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.5 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.
- B. Laminated Ceramic Glazing (Type 1): Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite Plus.
    - b. Schott North America, Inc.; Laminated Pyran Platinum L.
    - c. Vetrotech Saint-Gobain; SGG Keralite FR-L.
  - 2. Fire-Protection Rating: 20 minutes.
- C. Laminated Glass with Intumescent Interlayers (Type 2): Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. InterEdge, Inc., a subsidiary of AFG Industries, Inc.; Pyrobel.
    - b. Pilkington Group Limited (distributed by Technical Glass Products); PyroStop.
    - c. Vetrotech Saint-Gobain; SGG Contraflam N2.
  - 2. Fire-Protection Rating: 45 minutes, 60 minutes and 90 minutes.

## 2.6 GLAZING SEALANTS

### A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

### B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Dow Corning Corporation; 790.
  - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
  - c. May National Associates, Inc.; Bondaflex Sil 290.
  - d. Pecora Corporation; 890.
  - e. Sika Corporation, Construction Products Division; SikaSil-C990.
  - f. Tremco Incorporated; Spectrem 1.

### C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

## 2.7 GLAZING TAPES

### A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

### B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  2. Presence and functioning of weep systems.
  3. Minimum required face and edge clearances.
  4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.



- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and

installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 STRUCTURAL SILICONE JOINTS

- A. Inspect insulating units, verifying proper placement and support of setting blocks. Clean edge of insulating unit to assure full adhesion of sealant.
- B. Verify silicone has been checked for compatibility with the seals of insulating glass units and glazing channel substrates and gaskets.
- C. Stabilize glass, fully retained to prevent movement during curing of the joint sealant.
- D. Install backer rod to permit proper depth of joint sealant.
- E. Schedule sealant operations during periods of minimal wind to prevent pick up of airborne dust. Gun silicone into joint under pressure without displacing backer rod, fully wetting surfaces for full adhesion, providing weather tight seal. Gun or tool silicone, providing smooth uniform joint without excess material on glass. Remove smears from glass, using methods that do not damage glass or sealant.

### 3.8 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.

- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.9 MONOLITHIC GLASS SCHEDULE

- A. Tempered Glass: Clear fully tempered float glass.
  - 1. Minimum Thickness: 6 mm.
  - 2. Safety glazing required.
  - 3. Application: All interior glass, unless noted otherwise.

### 3.10 INSULATING GLASS SCHEDULE

- A. Low E Insulated Glass: Low-e-coated, clear insulating glass.
  - 1. Basis-of-Design Product: Solarban 60 (2) + Clear.
  - 2. Overall Unit Thickness 1 inch.
  - 3. Thickness of Each Glass Lite: 6.0 mm.
  - 4. Outdoor Lite: Tempered glass.
  - 5. Interspace Content: Air.
  - 6. Indoor Lite: Tempered glass.
  - 7. Visible Light Transmission: .70
  - 8. Winter Nighttime U-Factor: 0.29 maximum.
  - 9. Solar Heat Gain Coefficient: 0.39 minimum.
  - 10. Low-E Coating: Pyrolytic or sputtered on second and third surface.
  - 11. Provide tempered glass and safety glazing labeling where required by code.
  - 12. Application:

### 3.11 FIRE-PROTECTION-RATED GLAZING TYPES

- A. Fire Rated Glass, Type 1: 45-minute fire-rated glazing; laminated ceramic glazing.
  - 1. Provide safety glazing labeling.
- B. Fire Rated Glass, Type 2: 60-minute and 90-minute fire-rated glazing; laminated glass with intumescent interlayers.

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1. Provide safety glazing labeling.

END OF SECTION 088000

SECTION 092119 - 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 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For shaft wall assemblies and firestop tracks, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 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.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated.
- 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: 0.033 inch.
- C. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches 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: As indicated.
- F. Shaft-Side Finish: As indicated.
- 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Georgia-Pacific Building Products.
    - c. National Gypsum Company.
    - d. Temple-Inland Building Products by Georgia-Pacific.
    - e. United States Gypsum Company.
  - 2. Thickness: 1 inch.

3. Long Edges: Double bevel.

C. Gypsum Board: As specified in Section 092900 "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: ASTM A 653/A 653M, G40, hot-dip galvanized 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Fire Trak Corp.
- b. Metal-Lite.
- c. Steel Network, Inc. (The).

#### 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 092900 "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 092900 "Gypsum Board."

F. Acoustical Sealant: As specified in Section 092900 "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 078100 "Applied Fireproofing."
- 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.
- 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.



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- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

### 3.4 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 092119



SECTION 092900 - 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. Exterior gypsum board for ceilings and soffits.

B. Related Requirements:

- 1. Section 054000 "Cold-Formed Metal Framing" for gypsum sheathing for exterior walls.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Drawings: Submit drawings indicating locations of control joints.

C. Samples: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

D. Samples for Initial Selection: For each type of trim accessory indicated.

E. Samples for Verification: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or blotchy 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. American Gypsum.
  - 2. CertainTeed Corp.
  - 3. Georgia-Pacific Gypsum LLC.
  - 4. Lafarge North America Inc.
  - 5. National Gypsum Company.
  - 6. PABCO Gypsum.
  - 7. Temple-Inland.
  - 8. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch.

2. Long Edges: Tapered.

## 2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Exterior Gypsum Soffit Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.

1. Core: 5/8 inch, Type X.

## 2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material:

- a. Galvanized or aluminum-coated steel sheet or rolled zinc.
- b. Trim-Tex, Super Seal Tear Away™ L Bead where abutting exterior metal doors and windows.

2. Shapes:

- a. Cornerbead.
- b. Bullnose bead.
- c. LC-Bead: J-shaped; exposed long flange receives joint compound.
- d. Expansion (control) joint.

- B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
2. Shapes:

- a. Cornerbead.
- b. LC-Bead: J-shaped; exposed long flange receives joint compound.

## 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.

- B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. 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 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 or drying-type, all-purpose compound.

- a. Use setting-type taping with mold-resistant gypsum wallboard.
  - b. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
  4. Finish Coat: For third coat, use drying-type, all-purpose compound.
  5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Exterior Applications:
1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.

## 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Glass fiber batt mineral bearing the UL Classification Marking as to Fire Resistance.
  2. Insulation Support Anchors: Continuous, galvanized metal support strip, 0.032 inch (20 gage) thickness by 1 inch wide, with approximately 2 1/2 inch long pre-punched arrow shaped tabs at 8 inches on center.
    - a. Product: Insul-Hold; Insul-Hold Co., Inc., a division of J/R Metal Frames Manufacturing, Inc.
- E. Acoustical 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Pecora Corporation; AC-20 FTR or AIS-919.
  - b. USG Corporation; SHEETROCK Acoustical Sealant.
- F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."
- H. Fire-Resistive Joint Systems: As specified in Division 07 Section "Fire-Resistive Joint Systems."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Airtight Drywall Approach: Drywall shall be installed to comply with BSC Information Sheet 401 – Air Barriers – Airtight Drywall Approach. Sheet 401 attached at the end of this section.
- C. 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.
- D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- E. 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.
- F. Form control and expansion joints with space between edges of adjoining gypsum panels.
- G. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  2. Fit gypsum panels around ducts, pipes, and conduits.
  3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- I. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- J. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- K. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- L. Fire-Resistance-Rated Gypsum Board Assemblies: Provide fire-resistive joint system at the top of fire-resistance-rated gypsum board assemblies. Provide firestop system around any structural penetration of wall assembly.
- M. Smoke-Rated Gypsum Board Assemblies: Provide a tight, taped joint at the top of smoke-rated assemblies and around any penetrations to assemblies at both side of the assembly. The use of acoustical sealant will be acceptable to fill gaps up to 3/8 inch wide.
- N. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
1. Type X: Vertical and horizontal surfaces unless otherwise indicated.
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  2. On partitions/walls, apply gypsum panels vertically (parallel to metal framing) horizontally (perpendicular to wood framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.



- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
  - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
  1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
  2. Fasten with corrosion-resistant screws.

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 at locations indicated on approved Shop Drawings 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 where indicated.
  3. LC-Bead: Use at exposed panel edges.

4. L-Bead: Use where indicated.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

### 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 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 interior 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 3: Where indicated on Drawings.
  4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
  5. Level 5: At all apartment units.
- E. Exterior Gypsum Soffit Board: Finish according to manufacturer's written instructions for use as exposed soffit board. Provide level 4 finish.

### 3.7 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
  1. Complete the following in areas to receive gypsum board ceilings:
    - a. Installation, insulation, and leak and pressure testing of water piping systems.
    - b. Installation of air-duct systems.
    - c. Installation of air devices.
    - d. Installation of mechanical system control-air tubing.
    - e. Installation of ceiling support framing.
    - f. Installation of Penetration Firestopping and Joint Firestopping.

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.

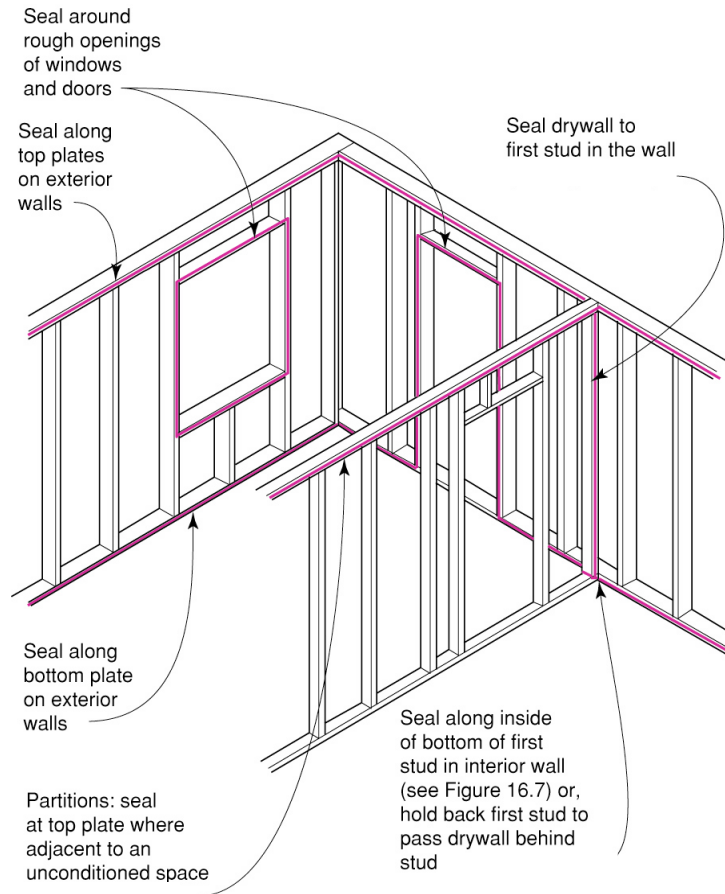
END OF SECTION 092900



## Air Barriers—Airtight Drywall Approach

for All Climates

### Sealing Perimeter of Drywall Assemblies



### Air Barriers—Airtight Drywall Approach

Gypsum board drywall is, itself, a suitable air barrier material. The taping of drywall seams results in a plane of airtightness at the field of the wall. However, several steps must be taken to use this material property to create a continuous and complete air barrier system. To do this, it is important to create air barrier continuity at the perimeter of drywall assemblies, at all penetrations through the drywall, and, finally, in areas of the enclosure without interior drywall.

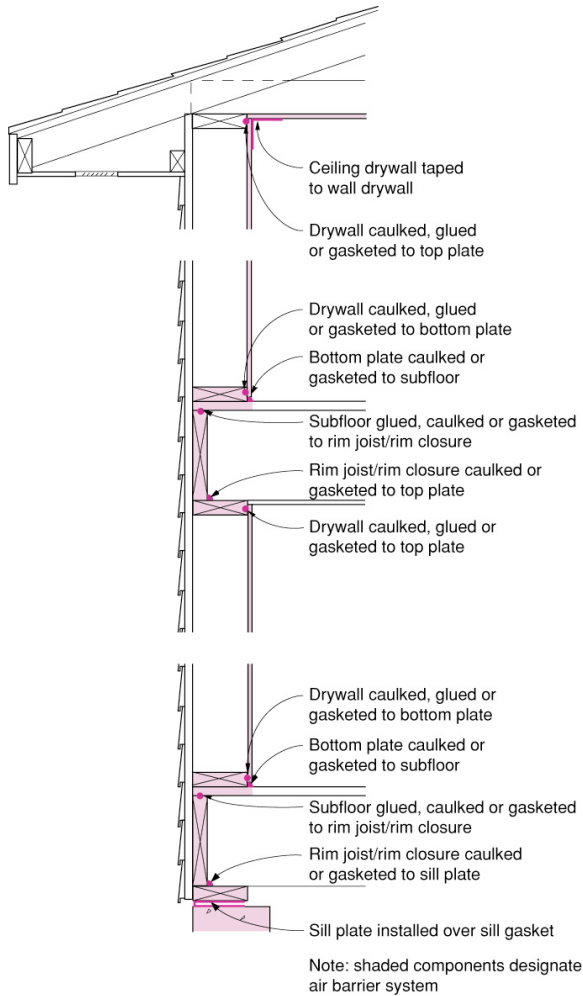
#### Drywall Assembly Perimeter

Air barrier continuity at the perimeter of drywall assemblies is achieved by sealing the edges of the drywall to solid framing materials. This requires a continuous bead of sealant along:

- all exterior wall bottom and top plates,
- all top plates at insulated ceilings,
- rough opening perimeters, and
- both sides of the first interior stud of partition walls.

The air seal at the partition wall intersection is shown in greater detail below.

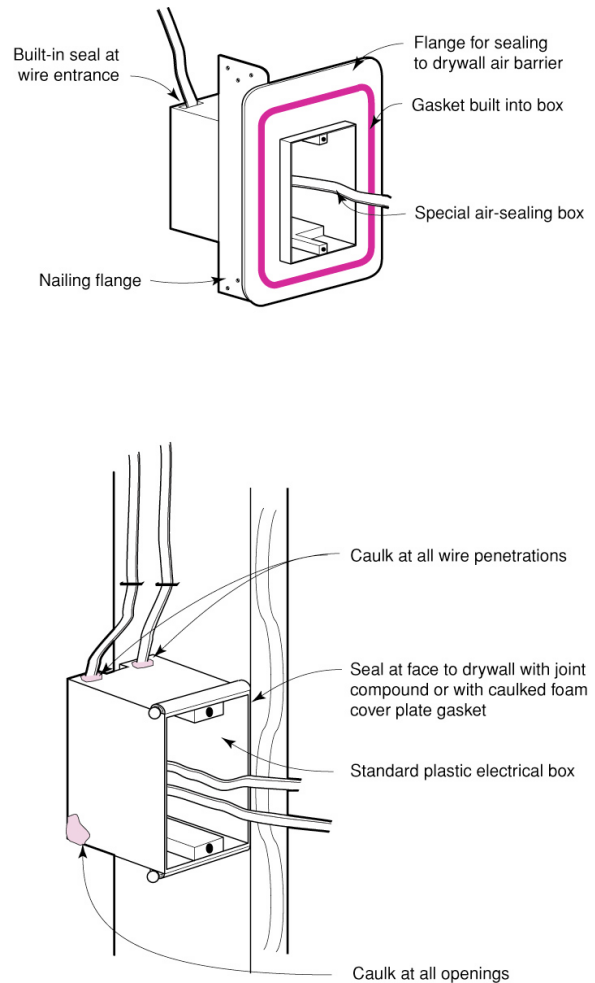
## Airtight Drywall Approach – Interior Air Barrier Using Drywall and Framing



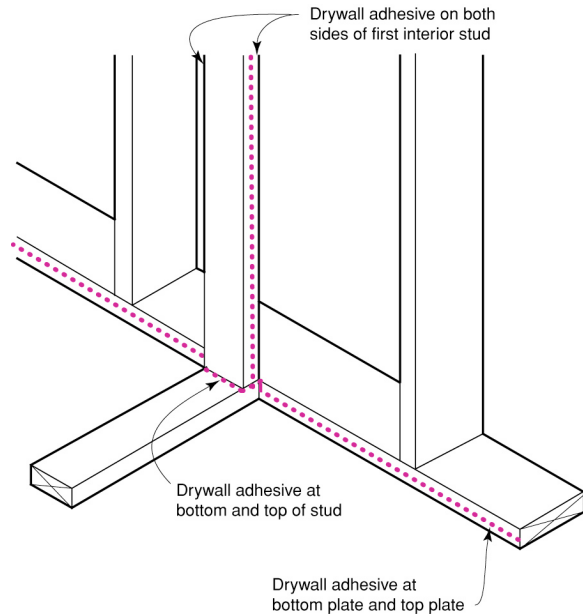
## Penetrations of Drywall Assemblies

Typical penetrations in exterior wall and ceiling drywall assemblies include electric penetrations – electric boxes and recessed fixtures. Electric boxes can be made air tight by caulking or sealing all openings in the box (including around wire penetrations) and by sealing the face of the box to the drywall. Specially designed airtight electric boxes with flexible boot seals at wire penetrations and a gasketed flange at the face can also provide air barrier continuity.

## Electric Box Penetrations

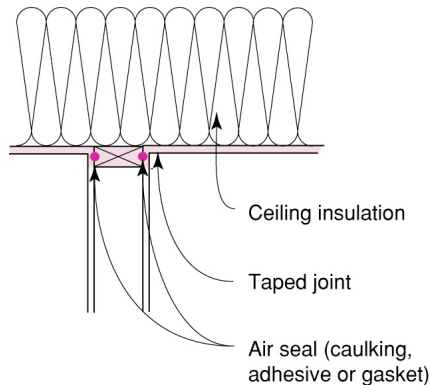


## Air Sealing at Partition



- Adhesive at bottom and top of partition stud allows air barrier to transition uninterrupted to other side of partition
- Penetrations through first partition stud must also be sealed

## Top Plate with Unconditioned Space Above



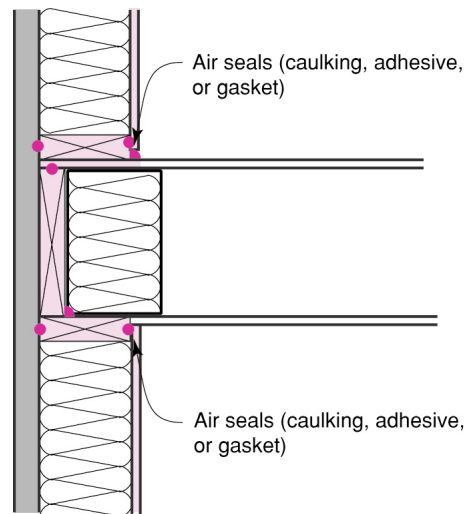
- Penetrations through top plate must also be sealed

Recessed ceiling fixtures in insulated ceiling should be both insulation contact (“IC”)- and air tight rated. The housing of the recessed fixture should also be sealed (with caulk or an effective gasket) to the ceiling gypsum board.

## Structural Framing Air Barrier Transitions

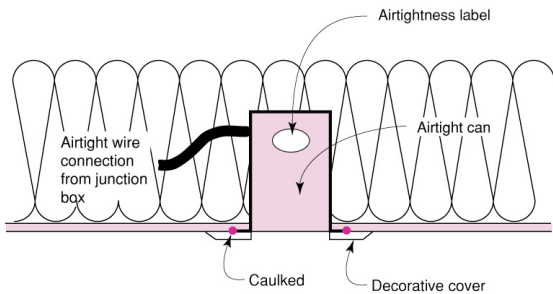
Obviously, drywall cannot provide an air barrier where it is absent. The diagrams below and to the right show how the air barrier continuity is maintained through the framing at rim joist/band joist areas. These measures form a necessary complement to drywall sealing in the airtight drywall approach. Refer to other Information Sheets for air sealing details at other common conditions. The resources listed below also illustrate air sealing details and provide further discussion.

## Intersection of Floor Joists and Exterior Wall



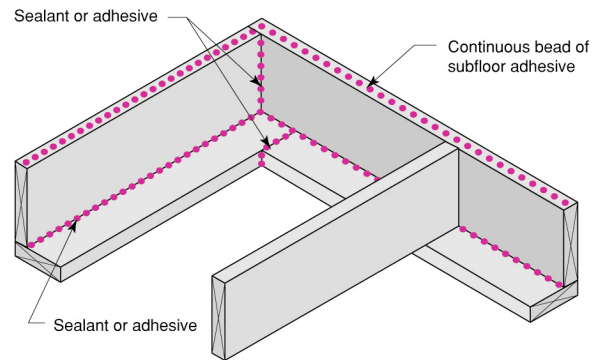
- Drywall sealed to top and bottom plates
- Bottom plate sealed to subfloor
- Subfloor sealed to rim closure board
- Rim closure board sealed to top plate

## Recessed Fixture in Insulated Ceiling



- Fixture labeled IC-rated and airtight as determined by ASTM E-283 air leakage test
- Housing (not decorative trim piece) sealed to ceiling with caulk or gasket

## Air Barrier Continuity at Rim Joist/Band Joist



- Continuous fillet bead applied at bottom of rim closure board
- Continuous bead of adhesive applied to top of rim closure board
- Sealant applied at all butt joints in rim closure board and sill plate/top plate
- Spray foam may also be used to seal between the sill/top plate, rim/band joist, and floor deck. Note that joints in the sill/top plate may not be sealed by the foam application.

## Suggestions for Further Research:

“Understanding Air Barriers”, Building Science Digest-104, [www.buildingscience.com](http://www.buildingscience.com).

“READ THIS: Before You Design, Build, or Renovate,” Building Science Primer-040, [www.buildingscience.com](http://www.buildingscience.com).

Lstiburek, Joseph W.; *Builder's Guide Series*, Building Science Press, 2006.



SECTION 093013 - CERAMIC TILING

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. Stone tile.
  - 2. Glazed wall tile.
  - 3. Tile backing panels.
  - 4. Crack isolation membrane.
  - 5. Metal edge strips.

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 its "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 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

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

- B. Shop Drawings: 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 tile, grout, and accessories involving color selection.
- D. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Full-size units of each type of trim and accessory for each color and finish required.
  - 3. Metal edge strips in 6-inch lengths.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.
- B. Tile Maintenance Report: Upon conclusion of the project, the Tiling Contractor shall furnish a tiling maintenance report. Report shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish, including grout, was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, repair procedures, and color samples of each color and finish used.

#### 1.8 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.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
  - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
  - 2. Obtain crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
  - 1. Crack isolation membrane.
  - 2. Metal edge strips.

### 2.2 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 TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

## 2.3 TILE PRODUCTS

- A. Stone Floor Tile (CT-1): Bathroom floor tile.

1. Stone Type: Marble, complying with ASTM C 503/C 503M.
2. Varieties and Sources:
  - a. Nero Marquina.
3. Finish: Honed.
4. Module Size: 1 inch hexagon mosaic.
5. Nominal Tile Thickness: 3/8 inch.
6. Joint Width: Manufacturer's standard.
7. Tile Color: Marquina black.
8. Grout Color: As selected by Architect from manufacturer's full range.

- B. Ceramic Wall Tile (CT-2): Bathroom wall tile.

1. Product: Galleria Stone and Tile; Longitude.
2. Module Size: 4 by 16 inches.
3. Face Size Variation: Rectified.
4. Thickness: Manufacturer's standard.
5. Face: Plain with cushion edges.
6. Finish: Glossy.
7. Tile Color: Deep Midnight.
8. Grout Color: As selected by Architect from manufacturer's full range.

- C. Ceramic Wall Tile (CT-3): Kitchen backsplash tile.

1. Product: Settecento; Crayons.
2. Module Size: 7.5 by 30 cm.
3. Face Size Variation: Rectified.
4. Thickness: Manufacturer's standard.
5. Face: Plain with cushion edges.
6. Finish: Glossy.
7. Tile Color: Charcoal.
8. Grout Color: As selected by Architect from manufacturer's full range.

## 2.4 TILE BACKING PANELS

- A. Fiber-Cement Backer Board: ASTM C 1288, in maximum lengths available to minimize end-to-end butt joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

## 221 CONGRESS STREET

- a. CertainTeed Corporation; Diamond GlasRoc Tile Backer.
  - b. James Hardie Building Products, Inc.: HardiBacker Cement Board.
2. Thickness: 1/2 inch.

### 2.5 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. Mold resistant anti-fracture membrane is composed of a modified latex elastomer that produces a monolithic surface.
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Merkrete™ Fracture Guard 7000.
- C. Maxxon 101 Overspray Primer MUST be used prior to application of the Merkrete membrane system.
- D. Overlays should be adhered using Merkrete 200 Krete Latex and 211 Krete Filler or 710 Premium Set Plus or any Merkrete latex fortified mortar to ensure compatibility.

### 2.6 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thinset for Floors): ANSI A118.4.
  1. Overlays should be adhered using Merkrete 200 Krete Latex and 211 Krete Filler or 710 Premium Set Plus or any Merkrete latex fortified mortar to ensure compatibility.
- B. Latex-Portland Cement Mortar (Thinset for Walls): ANSI A118.4.
  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. Laticrete International, Inc.
    - f. MAPEI Corporation.
  2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added 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.
- C. Organic Adhesive: ANSI A136.1, Type I.

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. Laticrete International, Inc.
  - f. MAPEI Corporation.

## 2.7 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. High-Performance Tile Grout (Polymer-Modified): 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. Laticrete International, Inc.
    - f. MAPEI Corporation.
  2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

## 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. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
- C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; satin anodized aluminum exposed-edge material.
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Schluter Systems L.P.
      - 1) Jolly edge trim. Provide at all exterior corners and wainscot top edge conditions.

- 2) Schiene transition trim. Provide at all floor tile transitions to other materials (equal thickness; carpet, rubber flooring).

D. Shower Trays:

1. Shower Tray 1: Kohler; Rely™ 60 by 32 inch single-threshold shower base with right-hand and left-hand drains as required. Color as selected by Architect.
2. Shower Tray 2: Kohler; Archer® 36 by 36 inch single-threshold center drain shower base with removable cover. Color as selected by Architect.

2.9 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard sanded acrylic caulking containing a mildew-cide or antimicrobial protection.
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- C. Products: Available products include the following:
  1. Keracaulk™ S by Mapei
  2. CeramaSeal by Bostik Findley

2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  2. Verify that concrete substrates for tile floors installed with thinset 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 thinset 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 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. Install shower trays as recommended by the tray manufacturer.

### 3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.



- F. 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.
- G. Joint Widths: Unless otherwise indicated, install tile with the joint widths as recommended by the tile manufacturer.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. 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.

### 3.4 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

### 3.5 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

### 3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Wood Subfloor:

- 1. Ceramic Floor Tile Installation: TCNA F180-07; thin-set on Maxxon Underlayment (16" joist spacing).
  - a. Ceramic Tile Type: Stone floor tile.
  - b. Bond Coat for Cured-Bed Method: Latex- portland cement mortar.
  - c. Grout: High-performance unsanded grout.

B. Interior Wall Installations, Wood or Metal Studs or Furring:

- 1. Ceramic Wall Tile Installation: TCNA W223; organic adhesive on solid backing.
  - a. Ceramic Tile Type: Ceramic wall tile at Kitchen Backsplash.
  - b. Grout: High-performance unsanded grout.

C. Bathtub/Shower Wall Installations, Wood or Metal Studs or Furring:

- 1. Ceramic Wall Tile Installation: TCNA B412; thinset mortar on cementitious backer units or fiber-cement backer board.
  - a. Ceramic Tile Type: Ceramic wall tile at Bathrooms.
  - b. Thinset Mortar: Latex- portland cement mortar.
  - c. Grout: High-performance unsanded grout.

D. Shower Receptor and Wall Installations:

- 1. Ceramic Wall Tile Installation: TCNA B415; thinset mortar on waterproof membrane over cementitious backer units or fiber-cement backer board.
  - a. Ceramic Tile Type: Ceramic wall tile.
  - b. Thinset Mortar: Latex- portland cement mortar.
  - c. Grout: High-performance unsanded grout.

END OF SECTION 093013

SECTION 096400 - WOOD FLOORING

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. Factory-finished wood flooring.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor assembly and accessory. Include plans, sections, and attachment details. Include expansion provisions and trim details.
- C. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately 12 inches long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Wood Flooring: Equal to 1 percent of amount installed for each type, color, and finish of wood flooring indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood flooring materials in unopened cartons or bundles.
- B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.
- C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.6 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.
  - 1. Environmental Conditioning: Maintain ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
  - 2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.
    - a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
    - b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install factory-finished wood flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 FACTORY-FINISHED WOOD FLOORING

- A. Engineered-Wood, Strip Flooring: HPVA EF.
  - 1. Product: Subject to compliance with requirements, provide the following:
    - a. Hallmark Floors; Ventura Collection.
  - 2. Species: White oak.
  - 3. Thickness: 1/2 inch.
  - 4. Construction: Three ply.
  - 5. Width: Nominal 7.5 inches.
  - 6. Length: Manufacturer's standard.
  - 7. Edge Style: Beveled (eased).
  - 8. Finish: UV urethane.
    - a. Color: As selected by Architect in manufacturer's full range.
- B. Solid-Wood Flooring (For Unit 5): Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.
  - 1. Product: Subject to compliance with requirements, provide the following:
    - a. Hallmark Floors; Organic Solid Collection.

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2. Species: Noni oak.
3. Thickness: 3/4 inch.
4. Face Width: 3-1/4 inches.
5. Length: Manufacturer's standard.
6. Edge Style: Beveled (eased).
7. Finish: UV urethane.
  - a. Color: As selected by Architect in manufacturer's full range.

### 2.2 ACCESSORY MATERIALS

- A. Building Paper: Standard rosin paper.
- B. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.
- C. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines."
- D. Thresholds and Saddles: To match wood flooring. Tapered on each side.
- E. Reducer Strips: To match wood flooring. 2 inches wide, tapered, and in thickness required to match height of flooring.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Cement Underlayment Slabs: Verify that substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

### 3.2 PREPARATION

- A. Concrete Slabs:
  1. Grind high spots and fill low spots to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
  2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
  3. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

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- B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in
- B. Provide expansion space at walls and other obstructions and terminations of flooring of not less than 1/2 inch.
- C. Vapor Retarder: Comply with the following for vapor retarder installation:
  - 1. Wood Flooring Installed Directly on Cement Underlayment: Install a layer of polyethylene sheet according to flooring manufacturer's written instructions.
- D. Engineered-Wood Flooring: Install floating floor.
- E. Solid-Wood Flooring: Blind nail flooring to substrate.

### 3.4 PROTECTION

- A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
  - 1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Vinyl base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

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1. 48 hours before installation.
  2. During installation.
  3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 VINYL BASE (RB-1)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
  2. Burke Mercer Flooring Products, Division of Burke Industries Inc.
  3. Flexco.
  4. Johnsonite; A Tarkett Company.
- B. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
1. Group: I (solid, homogeneous) or II (layered).
  2. Style and Location:
    - a. Style A, Straight: Provide in areas with carpet.
    - b. Style B, Cove: Provide in areas with resilient floor coverings.
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed or preformed.
- G. Inside Corners: Job formed or preformed.
- H. Colors: As selected by Architect from full range of industry colors.

### 2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.



- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

#### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Miter or cope corners to minimize open joints.

#### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum horizontal surfaces thoroughly.
  - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes modular textile composite flooring.
- B. Related Requirements:
  - 1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
  - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Samples for Initial Selection: For each type of carpet tile.
  - 1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.
- C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet Tile: Full-size Sample.
  - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

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- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

### 1.9 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, the following:
    - a. More than 10 percent edge raveling, snags, and runs.
    - b. Dimensional instability.
    - c. Excess static discharge.
    - d. Loss of tuft-bind strength.
    - e. Loss of face fiber.
    - f. Delamination.
  - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TEXTILE COMPOSITE FLOORING (CPT-1)

- A. Manufacturer: Subject to compliance with requirements, provide product by the following:
  - 1. J&J Industries, Inc.; Kinetex.
- B. Color: Foundry 1829.
- C. Wear Layer: Universal Fibers Polyester – applied pattern.
- D. Dye Method: Solution dyed.
- E. Total Thickness: 0.205 inches.
- F. Total Weight: 4.5-5.2 oz./sq. ft.
- G. Standard Backing: Polyester felt cushion.
- H. Size: 24 by 24 inches.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Gypsum Underlayment: Verify that finishes comply with requirements specified in Section 035413 "Gypsum Cement Underlayment" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
  - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
    - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.
- I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813





SECTION 099113 - EXTERIOR PAINTING

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 surface preparation and the application of paint systems on the following exterior substrates:
  - 1. Galvanized metal.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

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### 1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced Applicator who has completed painting system applications similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with 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.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

### 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin Moore & Co.
  - 2. California Paints.
  - 3. PPG Architectural Finishes, Inc. (Pittsburgh Paints, Glidden Professional, Flood Stains)
  - 4. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

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2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

1. Allow for up to 5 different color selections.

### 2.3 METAL PRIMERS

A. Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04.
2. Devco Coatings: 4020-1000 Devflex 4020PF DTM Primer & Flat Finish. (91 g/L)
3. Pittsburgh Paints: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel. (123 g/L)
4. Sherwin-Williams; IMC DTM Acrylic Primer/Finish, B66W1. (150 g/L)

### 2.4 EXTERIOR LATEX PAINTS

A. Exterior Semi-Gloss Acrylic Enamel: Factory-formulated semi-gloss acrylic enamel for exterior application.

1. Benjamin Moore; DTM Acrylic Semi-Gloss Enamel M29: Applied at a dry film thickness of not less than 2.0 mils.
2. California Paints: Rust Stop DTM 100% Acrylic Semi-Gloss, 10XX.
3. Devco Coatings; 4216-XXXX, High Performance Waterborne Acrylic Semi-Gloss Enamel.
4. Pittsburgh Paints: 6-900XI Speedhide Exterior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.5 mils.
5. Sherwin-Williams; IMC DTM Acrylic Coating Semi-Gloss (Waterborne) B66W200 Series. (250 g/L)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Uniformly abrade galvanized surfaces with a palm sander and 60 grit aluminum oxide so surface is free of oil and surface contaminants.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  - 4. Paint entire exposed surface of window frames and sashes.
  - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tinting: Tint primer of colors such as reds, yellows, and oranges with a gray basecoat system designed to help provide color coverage.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces. When using colors such as red, yellow or orange, an extra coat of finish may be necessary. Notify Architect when additional coats do not fix the problem.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 EXTERIOR PAINTING SCHEDULE

- A. Galvanized-Metal Substrates: Exterior hollow metal doors and frames, and exposed steel framing with intumescent coating.
  - 1. Acrylic Enamel Coating System:
    - a. Prime Coat: Primer, rust inhibitive, water based. Apply over shop primer.
    - b. Intermediate Coat: Acrylic enamel, matching topcoat.
    - c. Topcoat: Acrylic enamel, semi-gloss (MPI Gloss Level 5).

END OF SECTION 099113



SECTION 099123 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:
  - 1. Concrete.
  - 2. Concrete masonry units (CMUs).
  - 3. Steel.
  - 4. Galvanized metal.
  - 5. Wood.
  - 6. Gypsum board.
  - 7. Cotton or canvas insulation covering.
  - 8. ASJ insulation covering.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams

“Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

#### 1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced Applicator who has completed painting system applications similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

#### 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin Moore & Co.
  - 2. California Paints.
  - 3. PPG Architectural Finishes, Inc. (Pittsburgh Paints, Glidden Professional, Flood Stains)
  - 4. Samuel Cabot, Inc. (Cabot).
  - 5. Sherwin-Williams Company (The).
  - 6. Tnemec Company, Inc. (Tnemec).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.



2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

1. Allow for up to 10 different color selections.

2.3 BLOCK FILLERS

A. Latex Block Filler:

1. Cal: Mason Cote 100% Acrylic Block Filler, 3751.
2. Devoe Coatings: Bloxfil 4000-1000 Interior/Exterior Heavy Duty Acrylic Block Filler. (67 g/L)
3. Moore: Latex Block Filler No. M88.
4. PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler. (<50 g/L)
5. S-W: PrepRite Block Filler Interior/Exterior Latex B25W25 Series. (45 g/L)

2.4 PRIMERS/SEALERS

A. Low-VOC Latex Primer/Sealer:

1. Cal: Envirotech Zero VOC Interior Latex Primer/Sealer, 64600.
2. Moore: Pristine Eco Spec Interior Latex Primer Sealer, No. 231
3. Glidden Professional: 9116-1200 LifeMaster No VOC Interior Primer. (0 g/L)
4. PPG: Pure Performance Interior Latex Primer, 9-900 Series. (0 g/L)
5. SW: ProMar 200 Zero VOC Interior Latex Primer B28W02600 Series. (0 g/L)]

B. High-Build Primer/Sealer:

1. Cal: Hide-A-Spray, 91-20. (VOC 76 g/L)
2. Glidden Professional: 1040-1200, High Build Surfacer Interior Primer Sealer. (100g/L)
3. PPG: 6-1 Speedhide Interior MaxBuild High Build Surfacer. (<50 g/L)
4. SW: PrepRite High Build Interior Latex Primer/Surfacer B28W601 (VOC 74 g/L).
5. Moore: Super Spec Satin-Fil 172 (VOC 31g/L)

2.5 METAL PRIMERS

A. Rust-Inhibitive Primer (Water Based):

1. Cal: Rust Stop DTM 100% Acrylic Semi-Gloss, 10XX.
2. Devoe Coatings: 4020-1000 Devflex 4020PF DTM Primer & Flat Finish. (91 g/L)

3. Moore: IMC Acrylic Metal Primer M04. (51 g/L)
4. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel. (123 g/L)
5. S-W: IMC Pro-Cryl Universal Primer, B66-310 Series. (100 g/L)

## 2.6 WOOD PRIMERS

### A. Latex-Based Wood Primer:

1. Cal: ASAP "30" 50300.
2. Glidden Professional: 3210-1200 Gripper Interior/Exterior Primer Sealer. (100 g/L)
3. Moore: Super Spec Latex Enamel Undercoater & Primer Sealer #253.
4. PPG: Seal Grip Interior Primer/Finish, 17-951. (45 g/L)
5. S-W: PrepRite Classic Latex Primer B28W101 Series.

### B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

## 2.7 LATEX PAINTS

### A. Low-VOC Latex (Flat):

1. California Paints: Envirotech Zero VOC 100% Acrylic Flat, 633XX.
2. Glidden Professional: 1209-XXXXN Ultra-hide No VOC Interior Flat Paint (0 g/L)
3. Moore: Eco Spec Interior Latex Flat, No. 219.
4. PPG: 6-4110XI Series, Speedhide zero Interior Zero VOC Interior Flat Latex. (0 g/L)
5. SW: ProMar 200 Zero VOC Interior Latex Flat B30-2600 Series. (0 g/L)]

### B. Low-VOC Latex (Low Luster):

1. California Paints: Envirotech Zero VOC 100% Acrylic Eggshell, 631XX.
2. Glidden Professional: 1411-XXXX Ultra-hide No VOC Interior Eggshell Paint (0 g/L)
3. Moore: Pristine Eco Spec Interior Latex Eggshell, No. 223
4. PPG: 6-4310XI Series, Speedhide zero Interior Zero VOC Latex Eggshell Interior. (0 g/L)
5. SW: ProMar 200 Zero VOC Interior Latex Eg-Shell B20-2600 Series. (0 g/L)]

### C. Low-VOC Latex (Semi-gloss):

1. California Paints: Envirotech Zero VOC 100% Acrylic Semi-Gloss, 663XX.
2. Glidden Professional: 1415-XXXXN Ultra-hide No VOC Interior Semi-Gloss Paint (0 g/L)
3. Moore: Pristine Acrylic Semi-Gloss, No. 214
4. PPG: 6-4510XI Series, Speedhide zero Interior Zero VOC Latex Semi-Gloss. (0 g/L)
5. SW: ProMar 200 Zero VOC Interior Latex Semi-Gloss B31-2600 Series. (0 g/L)]

2.8 DRY FOG/FALL COATINGS

- A. Interior Acrylic Dry Fog/Fall:
  - 1. Tnemec: Uni-Bond DF, Series 115. No substitutions.

2.9 FLOOR COATINGS

- A. Latex Floor and Porch Paint (Low-Luster):
  - 1. Moore Latex Floor & Patio Enamel 122.
  - 2. Glidden Professional: 3018N Interior/Exterior Water-Based Porch & Floor Satin Enamel. (43 g/L)
  - 3. PPG: 3-510 Series Floor & Porch 100% Acrylic Satin Latex (96 g/L)
  - 4. S-W: Porch & Floor Enamel, Interior/Exterior A32-100 Series. (45 g/L)

2.10 INTERIOR FIRE RETARDANT COATINGS

- A. Ferrous Metal: Provide the following finish systems over ferrous metal:
  - 1. Semigloss, Intumescent Latex Finish: One finish coat over an undercoat.
    - a. Undercoat: Flat, latex, intumescent coating, applied at spreading rate recommended by the manufacturer.
      - 1) Flame Control: No. 20-20A Flat Latex Intumescent Fire Retardant Paint.
    - b. Finish Coat: Satin, latex, interior finish applied at spreading rate recommended by the manufacturer.
      - 1) Flame Control: No. 40-40A Low-gloss Latex Paint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMUs): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Gypsum Board: 12 percent.

- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Uniformly abrade galvanized surfaces with a palm sander and 60 grit aluminum oxide so surface is free of oil and surface contaminants.
- I. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.

3. Prime edges, ends, faces, undersides, and backsides of wood.
  4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- J. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tinting: Tint primer of colors such as reds, yellows, and oranges with a gray basecoat system designed to help provide color coverage.
1. Do not tint prime or base coat for multi-colored finishes.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces. When using colors such as red, yellow or orange, an extra coat of finish may be necessary. Notify Architect when additional coats do not fix the problem.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in equipment rooms: Not applicable.
  2. Paint the following work where exposed in occupied spaces:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.

- f. Plastic conduit.
  - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - h. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
  - 1. Low-Odor/VOC Latex System:
    - a. Block Filler: Block filler, latex, interior/exterior.
    - b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, low odor/VOC, flat (MPI Gloss Level 1).
    - d. Topcoat: Latex, interior, low odor/VOC eggshell (MPI Gloss Level 3).
    - e. Topcoat: Latex, interior, low odor/VOC, semi-gloss (MPI Gloss Level 5).
- B. Concrete Substrates, Traffic Surfaces:
  - 1. Latex Floor Enamel System:
    - a. Prime Coat: Floor paint, latex, matching topcoat.
    - b. Intermediate Coat: Floor paint, latex, matching topcoat.
    - c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3).
- C. CMU Substrates:
  - 1. Low-Odor/VOC Latex System:
    - a. Block Filler: Block filler, latex, interior/exterior.
    - b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, low odor/VOC, flat (MPI Gloss Level 1).

- d. Topcoat: Latex, interior, low odor/VOC eggshell (MPI Gloss Level 3).
  - e. Topcoat: Latex, interior, low odor/VOC, semi-gloss (MPI Gloss Level 5).
- D. Steel Substrates:
- 1. Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer, rust inhibitive, water based.
    - b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, low odor/VOC, semi-gloss (MPI Gloss Level 5).
- E. Galvanized-Metal Substrates:
- 1. Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer, rust inhibitive, water based.
    - b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, low odor/VOC, semi-gloss (MPI Gloss Level 5).
- F. Exposed Steel Ceiling Substrates: Including, but not limited to, structural support framing, metal deck, mechanical and electric piping, and ductwork.
- 1. DryFog/Fall System: Single coat application in accordance with manufacturer's instructions.
- G. Wood Substrates: Wood trim and doors.
- 1. Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer, latex, for interior wood.
    - b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, low odor/VOC, semi-gloss (MPI Gloss Level 5).
- H. Gypsum Board Substrates:
- 1. Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer sealer, interior, low odor/VOC.
    - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1) for ceilings and soffits.
    - d. Topcoat: Latex, interior, institutional low odor/VOC eggshell (MPI Gloss Level 3).
- I. Glass-Mat Gypsum Board Substrates:
- 1. Low-Odor/VOC Latex System:
    - a. Prime Coat: High-Build Primer/Sealer.
    - a. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    - b. Topcoat: Latex, interior, institutional low odor/VOC eggshell (MPI Gloss Level 3).
- J. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings.

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1. Low-Odor/VOC Latex System:
  - a. Prime Coat: Primer sealer, interior, low odor/VOC.
  - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
  - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1).

K. Interior Fire Retardant Coatings:

1. Ferrous Metal: One finish coat over an undercoat.
2. Wood: Two finish coats over a primer

END OF SECTION 099123



SECTION 102213 - WIRE MESH PARTITIONS

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. Standard-duty wire mesh partitions.

1.3 DEFINITIONS

- A. Intermediate Crimp: Wires pass over one and under the next adjacent wire in both directions, with wires crimped before weaving and with extra crimps between the intersections.
- B. Lock Crimp: Deep crimps at points of the intersection that lock wires securely in place.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Indicate clearances required for operation of doors.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: 12-by-12-inch panel constructed of specified frame members and wire mesh. Show method of finishing members at intersections.
- E. Delegated-Design Submittal: For wire mesh partitions indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

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

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### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wire mesh partition hardware to include in maintenance manuals.

### 1.7 QUALITY ASSURANCE

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

### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wire mesh items with cardboard protectors on perimeters of panels and doors and with posts wrapped to provide protection during transit and Project-site storage. Use vented plastic.
- B. Inventory wire mesh partition door hardware on receipt, and provide secure lockup for wire mesh partition door hardware delivered to Project site.
  - 1. Tag each item or package separately with identification, and include basic installation instructions with each item or package.

### 1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Acorn Wire & Iron Works, LLC.
  - 2. American Woven Wire Corporation.
  - 3. Indiana Wire Products, Inc.
  - 4. Miller Wire Works, Inc.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wire mesh units.
- B. Structural Performance: Wire mesh units shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

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1. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft. at any location on a panel.
  2. Total load of 200 lbf applied uniformly over each panel.
  3. Concentrated load and total load need not be assumed to act concurrently.
- C. Seismic Performance: Wire mesh units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Component Importance Factor: 1.0.

### 2.3 MATERIALS

- A. Steel Wire: ASTM A 510.
- B. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.
- C. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- D. Steel Pipe: ASTM A 53/A 53M, Schedule 40, unless another weight is indicated or required by structural loads.
- E. Steel Tubing: ASTM A 500/A 500M, cold-formed structural-steel tubing or ASTM A 513, Type 5, mandrel-drawn mechanical tubing.
- F. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.
- G. Post-Installed Anchors: Capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
  1. Material for Interior Locations: Carbon-steel components are zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
- H. Power-Driven Fasteners: ICC-ES AC70.
- I. Seismic Bracing: Angles with legs not less than 1-1/4 inch wide, formed from 0.040-inch thick, metallic-coated steel sheet; with bolted connections and 1/4-inch diameter bolts.
- J. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, complying with MPI#79.
  1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

### 2.4 STANDARD-DUTY WIRE MESH PARTITIONS

- A. Mesh: 0.135-inch diameter, intermediate-crimp steel wire woven into 1-1/2-inch diamond mesh.
- B. Vertical Panel Framing: 1-1/4-by-5/8-by-0.080-inch cold-rolled, C-shaped steel channels with holes for 1/4-inch diameter bolts not more than 12 inches o.c.

- C. Horizontal Panel Framing: 1-by-1/2-by-1/8-inch cold-rolled steel channels.
- D. Horizontal Panel Stiffeners: Two cold-rolled steel channels, 3/4 by 3/8 by 1/8 inch, bolted or riveted toe to toe through mesh or one 1-by-1/2-by-1/8-inch cold-rolled steel channel with wire mesh woven through channel.
- E. Top Capping Bars: 2-1/4-by-1-inch cold-rolled steel channels.
- F. Posts for 90-Degree Corners: 1-1/4-by-1-1/4-by-1/8-inch steel angles or square tubes with holes for 1/4-inch diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
- G. Three-Way Intersection Posts: 1-1/4-by-1-1/4-by-1/8-inch steel tubes or channels, with holes for 1/4-inch diameter bolts aligned for bolting to adjacent panels.
- H. Floor Shoes: Metal, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.
- I. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/4-by-1/2-by-1/8-inch steel channels or 1-1/4-by-5/8-by-0.080-inch cold-rolled, C-shaped steel channels, banded with 1-1/4-by-1/8-inch flat steel bar cover plates on four sides, and with 1/8-inch thick angle strike bar and cover on strike jamb.
  - 1. Hinges: Full-surface type, 3-by-3-inch steel, three per door; bolted, riveted, or welded to door and jamb framing.
  - 2. Cylinder Lock: Mortise type with cylinder specified in Section 087100 "Door Hardware"; operated by key outside and lever inside.
- J. Accessories:
  - 1. Sheet Metal Base: 0.060-inch thick steel sheet.
  - 2. Adjustable Filler Panels: 0.060-inch thick steel sheet, capable of filling openings from 2 to 12 inches.
  - 3. Wall Clips: Manufacturer's standard, steel sheet; allowing up to 1 inch of adjustment.
- K. Finish: Powder-coated finish unless otherwise indicated.
  - 1. Color: As selected by Architect from manufacturer's full range.

## 2.5 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
  - 1. Fabricate wire mesh items to be readily disassembled.
  - 2. Welding: Weld corner joints of framing and finish sand.
- B. Standard-Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.

1. Mesh: Securely clinch mesh to framing.
2. Framing: Fabricate framing with mortise and tenon corner construction.
  - a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
  - b. Fabricate three-way intersections using intersection posts.
  - c. Fabricate partition and door framing with slotted holes for connecting adjacent panels.
3. Fabricate wire mesh partitions with 3 to 4 inches of clear space between finished floor and bottom horizontal framing.
4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
5. Doors: Align bottom of door with bottom of adjacent panels.
  - a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.
6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

## 2.6 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- B. Shop Priming: Apply shop primer to uncoated surfaces of wire mesh units unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- C. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder-coat finish, suitable for use indicated, with a minimum dry film thickness of 2 mils.
  1. Color and Gloss: As selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors for suitable conditions where wire mesh items will be installed.
- C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 WIRE MESH PARTITIONS ERECTION

- A. Anchor wire mesh partitions to floor with 3/8-inch diameter postinstalled expansion anchors at 12 inches o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
  - 1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- B. Anchor wire mesh partitions to walls at 12 inches o.c. through back corner panel framing and as follows:
  - 1. For concrete and solid masonry anchorage, use expansion anchors.
  - 2. For hollow masonry anchorage, use toggle bolts.
- C. Secure top capping bars to top framing channels with 1/4-inch diameter "U" bolts spaced not more than 28 inches o.c.
- D. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.
- E. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
- F. Install doors complete with door hardware.
- G. Weld or bolt sheet metal bases to wire mesh partitions and doors.
- H. Bolt accessories to wire mesh partition framing.

### 3.3 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Remove and replace defective work, including doors and framing that are warped, bowed, or otherwise unacceptable.
- C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION 102213

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Private-use bathroom accessories.
- B. Related Requirements:
  - 1. Section 088000 "Glazing" for frameless mirrors.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
  - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.

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2. Identify accessories using designations indicated.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

### 1.6 CLOSEOUT SUBMITTALS

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

### 1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, visible silver spoilage defects.
  2. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PRIVATE-USE BATHROOM ACCESSORIES

- A. Refer to the Plumbing Fixture Schedule.

### 2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. 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.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.



2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

3.3 SCHEDULE

- A. Unit 2A Bathroom:
  - 1. Bathroom Tissue Holder.
  - 2. Towel Ring.
  - 3. Double Robe Hook.
- B. Unit 2A Master Bathroom:
  - 1. Bathroom Tissue Holder.
  - 2. Towel Ring.
  - 3. Towel Bar.
  - 4. Double Robe Hook.
- C. Unit 2B and 2C:
  - 1. Bathroom Tissue Holder.
  - 2. Towel Ring.
  - 3. Double Robe Hook.

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D. Unit D Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

E. Unit D Master Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

F. Unit E Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

G. Unit E Master Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

H. Unit F Master Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

I. Unit 3A Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Double Robe Hook.

J. Unit 3A Master Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

K. Unit 3B Bathroom:

1. Bathroom Tissue Holder.

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2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

L. Unit 3B Master Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

M. Unit 4A Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

N. Unit 4A Master Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

O. Unit 4B Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Double Robe Hook.

P. Unit 5A Powderroom:

1. Bathroom Tissue Holder.

Q. Unit 5A Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Double Robe Hook.

R. Unit 5A Master Bathroom:

1. Bathroom Tissue Holder.
2. Towel Ring.
3. Towel Bar.
4. Double Robe Hook.

END OF SECTION 102800



SECTION 102819 - TUB AND SHOWER 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 frameless shower doors and enclosures.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for shower doors and enclosures.
- B. Shop Drawings: For tub and shower doors and enclosures. Include plans, elevations, sections, and attachment details.
- C. Samples for Verification: For tub and shower doors and enclosures.
  - 1. Each type of mounting and operating hardware; full size.
  - 2. Glass and glazing; 12 inches square.
  - 3. Trim; 12-inch lengths.
- D. Product Schedule: For tub and shower doors and enclosures. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tub and shower doors and enclosures to include in maintenance manuals.

1.6 FIELD CONDITIONS

- A. Verify dimensions by field measurements before fabrication and indicate on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of tub and shower doors and enclosures that fail in materials or workmanship within specified warranty period without monetary limitation.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including excessive deflection.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal use.
  - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FRAMELESS ENCLOSURES

- A. Frameless glass panels with mounting and operating hardware of types and sizes required to support imposed loads.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. DreamLine: Quatra LUX Shower Doors.
- B. Hardware and Trim: Manufacturer's standard units as indicated and as required for complete installation.
  - 1. Materials:
    - a. Brass:
      - 1) Finish: Brushed Nickel.
- C. Bypass Doors: Sliding units suspended from extruded-aluminum header track by fully adjustable, sealed, heavy-duty ball-bearing rollers. Self-draining sill tracks with nylon panel guides. Molded jamb bumpers with concealed fasteners.
  - 1. Door Pulls: Full-door-width, single-sided towel bars.
  - 2. Safety Clip System: Manufacturer's standard safety device designed to prevent doors from falling off sliding track.
- D. Swinging Doors: Hinged for 180 degrees swing. Self-centering when doors are within 15 degrees of closed position. Soft bulb seal or wipes; affixed to door to direct water back into enclosure and provide a tight water seal.
  - 1. Hinges: Side hinged.
  - 2. Door Pulls: Back-to-back towel bars.
    - a. Towel Bar Length: 18 inches.

- E. Fixed Panels: Side and top-and-bottom mounts; match hinges in material and finish.
- F. Glazing: Safety glazing materials complying with 16 CFR 1201, Category II, with permanently etched identification acceptable to authorities having jurisdiction.
  - 1. Glass Nominal Thickness: 8 mm.
  - 2. Clear Glass: ASTM C 1048, Type I, Quality-Q3, Class I (clear), Kind FT.
- G. Fasteners: Manufacturer's standard stainless-steel or other noncorrosive fasteners.
- H. Sealant: Mildew-resistant, single-component, nonsag, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
  - 1. Sealant shall have a VOC content of 250 g/L or less.
- I. Materials:
  - 1. Stainless-Steel Bars and Shapes: ASTM A 276, Type 302 or 304.
  - 2. Copper-Alloy Sheet and Shapes: ASTM B 36/B 36M.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Prepare and install as recommended in manufacturer's written instructions unless more stringent requirements are contained in GANA's "Glazing Manual."
- B. Clean substrates, removing projections, filling voids, and sealing joints.
- C. Set units level, plumb, and true to line, without warp or rack of frames and panels, and anchor securely in place.
- D. Fasten components securely in place, with provisions for thermal movement. Install with concealed fasteners unless otherwise indicated.
- E. Install components to drain and return water to tub or shower.
- F. Install doors to produce smooth operation and tight fit at contact points.
- G. Repair, refinish, or replace components damaged during installation.

#### 3.2 ADJUSTING AND CLEANING

- A. Adjust operating parts and hardware for smooth, quiet operation and watertight closure. Lubricate hardware and moving parts.

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- B. Remove nonpermanent labels, and clean surfaces immediately after installation.

END OF SECTION 102819



SECTION 104413 - FIRE PROTECTION CABINETS

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. Fire-protection cabinets for the following:
    - a. Portable fire extinguishers.
- B. Related Requirements:
  - 1. Section 104416 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

### 2.2 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - b. Larsens Manufacturing Company.
    - c. Potter Roemer LLC.
  - 2. Available Products: Subject to compliance with requirements, provide one of the following.
    - a. J.L. Industries: Cosmopolitan Series C8135F17.
    - b. Larsen's: Architectural Series SS 2409-R2.
    - c. Potter-Roemer: Alta Series 7061-A-4.
- B. Cabinet Construction: Nonrated.
  - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Cold-rolled steel sheet.
  - 1. Shelf: Same metal and finish as cabinet.
- D. Recessed Cabinet:
  - 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- E. Cabinet Trim Material: Stainless-steel sheet.
- F. Door Material: Stainless-steel sheet.
- G. Door Style: Fully glazed panel with frame.

- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide projecting door pull and friction latch.
  - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Materials:
  - 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
    - a. Finish: Baked enamel or powder coat.
    - b. Color: White.
  - 2. Stainless Steel: ASTM A 666, Type 304.
    - a. Finish: No. 4 directional satin finish.
  - 3. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

### 2.3 IDENTIFICATION

- A. Identification: Projecting sign with lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
  - 1. Available Products:
    - a. PTD-182 by Larsen.
    - b. PTD109 by J.L. Industries.
  - 2. Location: Applied to wall above extinguisher.
  - 3. Application Process: Pressure-sensitive tape or screw fasteners.
  - 4. Lettering Color: White on red background with graphic of fire extinguisher and arrow pointing down.

### 2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  - 1. Weld joints and grind smooth.
  - 2. Provide factory-drilled mounting holes.
  - 3. Prepare doors and frames to receive locks.
  - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

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1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
  2. Fabricate door frames of one-piece construction with edges flanged.
  3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

### 2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed or semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare recesses for recessed or semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

### 3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
  1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.

2. Provide inside latch and lock for break-glass panels.
  3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Identification: Install identification above fire extinguisher cabinet.

### 3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413



SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:
  - 1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10.
    - b. Faulty operation of valves or release levers.
  - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Amerex Corporation.
    - b. Ansul Incorporated; Tyco International.
    - c. Badger Fire Protection.
    - d. Buckeye Fire Equipment Company.
    - e. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - f. Kidde Residential and Commercial Division.
    - g. Larsens Manufacturing Company.
    - h. Potter Roemer LLC.
  - 2. Valves: Manufacturer's standard.
  - 3. Handles and Levers: Manufacturer's standard.
  - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.



- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

### 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.

### 2.4 IDENTIFICATION

- A. Identification: Projecting sign with lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
  - 1. Available Products:
    - a. PTD-182 by Larsen.
    - b. PTD109 by J.L. Industries.
  - 2. Location: Applied to wall above extinguisher.
  - 3. Application Process: Pressure-sensitive tape or screw fasteners.
  - 4. Lettering Color: White on red background with graphic of fire extinguisher and arrow pointing down.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
  - 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
- C. Install a fire extinguisher in each fire extinguisher cabinet.
- D. Identification: Install identification above each wall-mounted fire extinguisher.

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END OF SECTION 104416

SECTION 105500.13 - USPS-DELIVERY POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Mail receptacles.
- 2. Parcel lockers.
- 3. Accessories.

1.3 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of postal specialty.

- B. Shop Drawings: For postal specialties.

- 1. Include plans, elevations, sections, and attachment details.
- 2. Include identification sequence for compartments.
- 3. Include layout of identification text.
- 4. Include setting drawings, templates, and installation instructions for anchor bolts and other anchorages installed as part of the Work of other Sections.

- C. Samples for Verification: For each type of exposed finish, prepared on 6-by-6-inch square Samples.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of postal specialty required to comply with USPS regulations, signed by product manufacturer. Include written approval by Postmaster General.

- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For postal specialties and finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Key Blanks: 10.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Furnish lock keys according to USPS requirements; with temporary identification for their respective locks, bagged, and securely taped inside the collection compartment for shipping.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Faulty operation of hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MAIL RECEPTACLES

- A. Front-Loading Mail Receptacles: Consisting of multiple compartments with fixed, solid compartment backs, enclosed within a recessed wall box. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging side-hinged master door to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS-STD-4C.
  - 1. Manufacturer: Subject to compliance with requirements, provide products by the following:
    - a. AF Florence Manufacturing Company; Gibraltar Industries.
  - 2. Front-Loading Master Door: Fabricated from extruded aluminum and braced and framed to hold compartment doors; prepared to receive master-door lock.
    - a. Master-Door Lock: Door prepared to receive lock provided by local postmaster.
  - 3. Compartments: Number and size as follows: Florence recessed, 4C15D-17.

- a. Type II: A group of mail receptacles in double-column configuration with double master door, 17 mail compartments not less than 3 inches high by 12 inches wide by 15 inches deep, one outgoing mail collection compartment prepared for master-door lock, and two parcel-locker compartments.
  - b. Dimensions: 54-3/4 inches high by 31-9/16 inches wide by 17 inches deep.
4. Compartment Doors: Fabricated from extruded aluminum. Equip each with lock and tenant identification as required by USPS-STD-4C. Provide mail slot in the compartment with master-door lock.
- a. Compartment-Door Locks: Comply with USPS-L-1172C for locks and keys, or equivalent as approved by the USPS; with three keys for each compartment door. Key each compartment differently.
  - b. Parcel-Locker-Compartment-Door Locks: Two-key security system in which control key provides access to parcel-locker-compartment key, which opens compartment and is retained once opened.
5. Frames: Fabricated from extruded aluminum or aluminum sheet; ganged and nested units, with cardholder and blank cards for tenant's identification within each compartment.
6. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
7. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
- a. Clear Anodized Aluminum Finish.

## 2.2 FABRICATION

- A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch. Fabricate doors of postal specialties to preclude binding, warping, or misalignment.
- B. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly.
- C. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.
- D. Drill or punch holes required for fasteners and remove burrs. Use security fasteners where fasteners are exposed. If used, seal external rivets before finishing.
- E. Weld in concealed locations to greatest extent possible without distorting or discoloring exposed surfaces. Remove weld spatter and welding oxides from exposed surfaces.
- F. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support loads.
- G. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturers of dissimilar metals.

### 2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for roughing-in openings, clearances, and other conditions affecting performance of the Work.
- B. Examine walls and other adjacent construction for suitable conditions before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install postal specialties level and plumb, according to manufacturer's written instructions.
  - 1. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturer.
  - 2. Where aluminum contacts grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.
  - 3. Final acceptance of postal specialties served by the USPS depends on compliance with USPS requirements.
- B. Mail Receptacles: Install mail receptacles with center of tenant-door lock cylinders and bottom of compartments at the maximum and minimum heights above finished floor established by the USPS and manufacturer's written instructions.
  - 1. Install removable-core and keyed-in door lock cylinders as required for each type of cylinder lock.

3.3 FIELD QUALITY CONTROL

- A. Arrange for USPS personnel to examine and test postal specialties served by the USPS after they have been installed according to USPS regulations.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as postal specialties are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust doors, hardware, and moving parts to function smoothly, and lubricate as recommended by manufacturer. Verify that integral locking devices operate properly.
- C. Touch up marred finishes or replace postal specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by postal-specialty manufacturer.
- D. Replace postal specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. On completion of postal-specialty installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION 105500.13





SECTION 108000 - OTHER SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Knox box.
2. Elevator vent.
3. Fireplaces.

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

PART 2 - PRODUCTS

2.1 KNOX BOX

A. Where indicated on the drawings, provide Series 3200 Hinged Door Model, recessed mounted with face flange key box by Knox Box. Constructed of 1/4 inch plate steel housing, 1/2 inch thick steel door with interior gasket seal. Box and lock to be UL Listed.

1. Dimensions: 7 inches wide by 7 inches high by 3-3/4 inches deep.
2. Capacity: Holds up to 10 keys and access cards in interior compartment.
3. Finish: Manufacturer's standard finish.
4. Color: Aluminum.
5. Options:

a. Recessed mounting kit.

2.2 ELEVATOR VENT

A. Gravity ventilator comprised of three sides of standard stationary non-drainable louver along with one side of 1/8-in. thick plate glass that can be broken with the pressure of a fire hose. A fire smoke damper is located in the throat of the curb and wired into the fire control panel. The unit is shop-assembled and shipped complete.

B. Available Products include the following:

1. Buckley Associates, Inc.; Model PELV-100.
2. Greenheck; Model PEV-400.

3. McDermott Metal Works Corp.; Model M445.

## 2.3 FIREPLACES

- A. Provide Heatilator, Novus NEVO3630 direct vent gas fireplace, black color.

## 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.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust specialties for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

### 3.3 CLEANING

- A. Clean surfaces prior to inspection. Replace damaged or defective items.

END OF SECTION 108000

SECTION 113100 - RESIDENTIAL APPLIANCES

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. Cooking appliances.
  - 2. Kitchen exhaust ventilation.
  - 3. Refrigeration appliances.
  - 4. Cleaning appliances.
  - 5. Disposals.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of appliance.
- C. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Gas-Fuel Conversion: Provide gas-fueled appliances with manufacturer's propane conversion kit installed by a qualified service agency according to manufacturer's written instructions for Project location and type of fuel.

1.7 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide product indicated in the Appliance Schedule on Sheet A-0.3.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.
- C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

2.3 RANGES

- A. Gas Range: Slide-in range with one oven.
  - 1. Basis-of-Design Product: Bosch HGI8054UC.
  - 2. Width: 61 cm.

2.4 MICROWAVE OVENS

- A. Microwave Oven:

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1. Basis-of-Design Product: Bosch HMB5051.
2. Mounting: Cabinet with trim.
3. Type: Conventional.

### 2.5 KITCHEN EXHAUST VENTILATION

#### A. Overhead Exhaust Hood:

1. Basis-of-Design Product: XO XOC30S.
2. Type: Under cabinet, glide-out exhaust-hood system.
3. Dimensions:
  - a. Width: 30 inches.

### 2.6 REFRIGERATOR/FREEZERS

#### A. Refrigerator/Freezer: Two-door refrigerator/freezer with freezer on bottom and complying with AHAM HRF-1.

1. Basis-of-Design Product: Bosch B21CL81SNS.
2. Type: Freestanding.
3. Dimensions:
  - a. Width: 911 mm.
  - b. Depth: 728 mm.
  - c. Height: 1,775 mm.

### 2.7 DISHWASHERS

#### A. Dishwasher: Complying with AHAM DW-1.

1. Basis-of-Design Product: Bosch SHP65TL5UC.
2. Type: Built-in undercounter.
3. Dimensions:
  - a. Width: 24 inches.
  - b. Depth: 23 inches.
  - c. Height: 34-1/2 inches.

### 2.8 DISPOSALS

#### A. Disposal: Waste King 9950.

### 2.9 GENERAL FINISH REQUIREMENTS

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

- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

#### 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
  - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After installation, start units to confirm proper operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

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- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 113100





SECTION 122413 - ROLLER WINDOW SHADES

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. Manually operated roller shades with single rollers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- C. Samples: For each exposed product and for each color and texture specified, 10 inches long.
- D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of shadeband material, signed by product manufacturer.
- C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

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### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

### 1.9 WARRANTY

- A. Roller Shade Hardware and Chain: Manufacturer's standard non-depreciating twenty-five year limited warranty.
- B. Shade Cloth: Standard non-depreciating 10-year limited warranty.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade by MechoShade Systems, Inc. or an approved substitute.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

### 2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
  - 1. Bead Chains: Nickel-plated metal.

- a. Loop Length: Full length of roller shade.
  - b. Limit Stops: Provide upper and lower ball stops.
  - c. Chain-Retainer Type: Clip, jamb mount.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
1. Roller Drive-End Location: Right side of inside face of shade.
  2. Direction of Shadeband Roll: Regular, from back of roller.
  3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Shadebands:
1. Shadeband Material: Light-filtering fabric.
  2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: Enclosed in sealed pocket of shadeband material.
    - b. Color and Finish: As selected by Architect from manufacturer's full range.
- F. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
    - a. Shape: L-shaped.
    - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches.
  2. Endcap Covers: To cover exposed endcaps.
  3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

### 2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Shade Cloth: EcoVeil group, 1550 Series, fabricated from TPO for both core yarn and jacket, single thickness, non-raveling 0.030 inch (0.762 mm) thick fabric.
1. Fabric Width: As required for windows.
  2. Weave: 3 percent open 2 x 2 basket weave.
  3. Colors: As selected by Architect from manufacturer's full range

4. Bottom Hem: Straight.

#### 2.4 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
  1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
  2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
  1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
  2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
  1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

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3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 SCHDEULE

- A. Provide for all residential window units.

END OF SECTION 122413



SECTION 123530 - 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:
  - 1. Kitchen cabinets.
  - 2. Vanity cabinets.
- B. Related Requirements:
  - 1. Section 123661 "Simulated 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: 8-by-10-inch Samples for each type of finish and the following:

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1. Exposed hardware, for each type of item.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For casework.

### 1.6 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.
- C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.

### 1.7 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by the following:
  1. Cabinets: Constructed by Woodhull of Maine.

### 2.2 CABINETS

- A. Face Style: Flush overlay; door and drawer faces cover cabinet fronts with only enough space between faces for operating clearance.
- B. Cabinet Style: Frameless.
- C. Door and Drawer Fronts: 3/4 inch thick MDF.



- D. Cabinet Boxes: 3/4 inch thick maple plywood with maple edge banding.
- E. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
  - 1. Join subfronts, backs, and sides with half-blind dovetail joints.
  - 2. Subfronts, Backs, and Sides: 1/2-inch- thick solid wood.
  - 3. Bottoms: 1/4-inch- thick plywood.
- F. Shelves: 3/4-inch thick plywood with maple edge banding.
- G. 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.
- H. Factory Finishing: Finish cabinets at factory. Defer only final touchup until after installation.

### 2.3 CABINET MATERIALS

- A. Hardwood Plywood: HPVA HP-1.
- B. MDF: ANSI A208.2, Grade MD.

### 2.4 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with type, size, style, material, and finish as indicated on the drawings.
- B. Pulls: To be determined.
- C. Hinges: Concealed European-style, self-closing hinges; Blum 110 soft-close or equal.
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; Blum 553 soft-close or equal.
- E. Trash Pull-outs: Custom fabrication to accommodate trash and recycling bins.

### 2.5 FINISH

### 2.6 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
- D. Painted Finish: Manufacturer's standard paint finish.

### 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.
- 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 o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch 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.

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END OF SECTION 123530



SECTION 123661 - SIMULATED 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:
  - 1. Solid-surface-material countertops and backsplashes.
- B. Related Sections:
  - 1. Section 123640 "Stone Countertops."

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
  - 1. Countertop material, 6 inches square.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.5 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
  - 1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
    - a. E. I. du Pont de Nemours and Company; Corian.
  - 2. Type: Provide Standard Type unless Special Purpose Type is indicated.
  - 3. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
  - 4. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 SOLID-SURFACE-MATERIAL COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
  - 1. Grade: Premium.
- B. Configuration: Provide countertops with the following front and backsplash style:
  - 1. Front: Beveled.
  - 2. Backsplash: Beveled.
  - 3. Endsplash: Matching backsplash.
- C. Countertops: 1/2-inch-thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch-thick, solid surface material.
- E. Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  - 1. Fabricate with loose backsplashes for field assembly.
  - 2. Install integral sink bowls in countertops in the shop.
- F. Joints: Fabricate countertops without joints.
- G. Joints: Fabricate countertops in sections for joining in field.
  - 1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
  - 2. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.

H. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
  - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
  - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
  - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

END OF SECTION 123661





## SECTION 142100 – ELECTRIC TRACTION ELEVATORS

### 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. This Section specifies electric traction elevators.
- B. Work Required:
  - 1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.
  - 2. All work shall be performed in a first class, safe and workmanlike manner.
  - 3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.
- C. Applicable Codes: Comply with applicable building and elevator codes at the project site, including but not limited to the following:
  - 1. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
  - 2. ADAAG, Americans with Disabilities Act Accessibility Guidelines.
  - 3. ANSI/NFPA 70, National Electrical Code.
  - 4. ANSI/NFPA 80, Fire Doors and Windows.
  - 5. ASME/ANSI A17.7, Safety Code for Elevators and Escalators.
  - 6. ANSI/UL 10B, Fire Tests of Door Assemblies.
  - 7. CAN/CSA C22.1, Canadian Electrical Code.
  - 8. CAN/CSA-B44, Safety Code for Elevators and Escalators.
  - 9. EN 12016 (May 1998): “EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity”
  - 10. Local Building Codes
  - 11. All other local applicable codes.

#### 1.3 SYSTEM DESCRIPTION

- A. Equipment Description: Gen2® gearless machine-room less elevator where all components fit inside the hoistway.
- B. Equipment Control: Elevonic® Control System.

- C. Drive: Regenerative
- D. Quantity of Elevators: One.
- E. Elevator Stop Designations: P, 1, 2, 3, 4, 5.
- F. Stops : 6.
- G. Openings: 2 in line front, 4 in line rear.
- H. Travel: 54 feet total rise.
- I. Rated Capacity: 3500 lb..
- J. Rated Speed: 150 fpm.
- K. Platform Size: 6'-6 3/4" W x 6'-8 3/16" D.
- L. Clear Inside Dimensions: 6'-5 9/16" W x 5'-6 1/8" D
- M. Cab Height: 7'9" or 9'9"
- N. Clear Cab Height [Select one]:
  - 1. 9'-9" with 5/16" floor recess and 4 LED ceiling.
  - 2. 9'-4 3/8" with 5/16" floor recess and dropped 6 LED or 10 LED ceiling.
  - 3. 9'-8 1/16" with 1-1/4" floor recess and 4 LED ceiling.
  - 4. 9'-3 3/8" with 1-1/4" floor recess and dropped 6 LED or 10 LED ceiling.
- O. Entrance Type and Width: Center-Open Doors 42 inches.
- P. Entrance Height: 7'-0".
- Q. Main Power Supply: 208, 220-240, 440-480 or 600 Volts + or - 5% of normal, three-Phase, with a separate equipment grounding conductor. Transformer (by others) required for voltages other than 208, 220-240, 440-480 volts.
- R. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.
- S. Machine Location: Inside the hoistway at the top of the hoistway.
- T. Signal Fixtures: Manufacturer's standard with metal button targets (exc. CA).
- U. Controller Location: Machine-Roomless Controller must be in the front wall on the same side as the counterweight, located at the top landing.
- V. Performance:
  - 1. Car Speed:  $\pm 3\%$  of contract speed under any loading condition or direction of travel.

2. Car Capacity: Safely lower, stop and hold up to 120% of rated load. (code required).
3. Ride Quality:
  - a. Vertical Vibration (maximum): 20 milli-g
  - b. Horizontal Vibration (maximum): 12 milli-g
  - c. Vertical Jerk (maximum):  $4.59 \pm 1.0 \text{ ft./ sec}^3$  ( $1.4 \pm 0.3 \text{ m/ sec}^3$ )
  - d. Acceleration/Deceleration (maximum):  $2.62 \text{ ft./ sec}^2$  ( $0.8 \text{ m/ sec}^2$ )
  - e. In Car Noise: 55 – 60 dB(A)
  - f. Stopping Accuracy:  $\pm 0.375 \text{ in.}$  ( $\pm 10 \text{ mm}$ ) max,  $\pm 0.25 \text{ in.}$  ( $\pm 6 \text{ mm}$ ) Typical
  - g. Re-leveling Distance:  $\pm 0.5 \text{ in.}$  ( $\pm 12 \text{ mm}$ ).

W. Operation: Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

X. Operating Features – Standard

1. Full Collective Operation
2. Anti-nuisance.
3. Fan and Light Protection.
4. Load Weighing Bypass.
5. Independent Service.
6. Full Collective Operation.
7. Firefighters' Service Phase I and Phase II.
8. Top of Car Inspection.

Y. Door Control Features:

1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.  
Door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening.
3. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

Z. Provide equipment according to seismic zone: 0/1.

#### 1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:

1. Signal and operating fixtures, operating panels and indicators.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in hoistway (BTU).

6. Color selection chart for Cab and Entrances.

B. Shop Drawings: Submit approval layout drawings. Include the following:

1. Car, guide rails, buffers and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Clearances and travel of car.
5. Clear inside hoistway and pit dimensions.
6. Location and sizes of access doors, hoistway entrances and frames.

C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

### 1.5 QUALITY ASSURANCE

A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.

B. Installer: Elevators shall be installed by the manufacturer.

C. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations or such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

### 1.6 DELIVERY, STORAGE, AND HANDLING

A. A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.

B. Should the storage area be off-site and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

### 1.7 WARRANTY

A. The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The warranty period shall not extend longer than one (1) year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The warranty excludes: ordinary wear and tear, improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

1.8 MAINTENANCE SERVICE

- A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of [twelve (12) months after the elevator has been turned over for the customer's use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.
- B. The periodic lubrication of elevator components shall **not** be required, including: Sheaves, Rails, Belts, Ropes, Car and CWT guides, etc.
- C. The elevator control system must:
  - 1. Provide in the controller the necessary devices to run the elevator on inspection operation.
  - 2. Provide on top of the car the necessary devices to run the elevator in inspection operation.
  - 3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
  - 4. Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
  - 5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
  - 6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
- D. Provide system capabilities to enable a remote expert to create a live, interactive connection with the elevator system to enable the following functions:
  - 1. Remotely diagnose elevator issues with a remote team of experts
  - 2. Remotely return an elevator to service
  - 3. Provide real-time status updates via email
  - 4. Remotely make changes to selected elevator functions including:
    - a. Control building traffic: Restrict floor access, remove car from group operation, shut down elevator, select up peak/down peak mode, activate independent service.
    - b. Conserve energy: Activate cab light energy save mode, activate fan energy save mode, shut down car.
    - c. Improve passenger experience: Extend door open times, change parking floor, activate auto car full, activate anti-nuisance, advance door opening, door nudging, extend specific floor extended opening time, release trapped passengers.

## PART 2 - PRODUCTS

### 2.1 DESIGN AND SPECIFICATIONS

- A. Provide machine-roomless Gen2™ traction passenger elevators from Otis Elevator Company. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:
1. Controller located entirely inside the hoistway. No extra machine room or control closet space required.
  2. An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.
  3. Polyurethane Coated-Steel Belts for elevator hoisting purposes.
  4. Regenerative drive that captures normally wasted energy and feeds clean power back into the building's power grid.
  5. LED lighting standard in ceiling lights and elevator fixtures.
  6. Sleep mode operation for LED ceiling lights and car fan.
- B. Approved Installer: Otis Elevator Company

### 2.2 EQUIPMENT: CONTROLLER COMPONENTS

- A. Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.
1. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
  2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
  3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
  4. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"
  5. Controller shall be located inside the wall next to the top landing entrance frame. Emergency access shall be provided through an access panel in the entrance frame secured by a key lock.
  6. A separate control room or cabinet should not be required.
- B. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

### 2.3 EQUIPMENT: MACHINE AND GOVERNOR

- A. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.

- B. Governor: The governor shall be a tension type car-mounted governor.
- C. Buffers, Car and Counterweight: Polyurethane type buffers shall be used.
- D. Hoistway Operating Devices:
  - 1. Emergency stop switch in the pit.
  - 2. Terminal stopping switches.
- E. Positioning System: Consists of an encoder, reader box, and door zone vanes.
- F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
- G. Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.
- H. Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.
- I. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.
- J. Hoistway Entrances:
  - 1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.
  - 2. Sills shall be extruded aluminum, **or** bronze finish, **or** nickel silver finish.
  - 3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
  - 4. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour
  - 5. Entrance Finish: Satin finish stainless steel.
  - 6. Entrance marking plates: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
  - 7. Sight Guards: sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel and gold satin doors.

#### 2.4 EQUIPMENT: CAR COMPONENTS

- A. Car frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall be Type "B", flexible guide clamp type.
- B. Cab [Select one]:

1. Steel Shell Cab with **painted** vertical removable panels
2. Steel Shell Cab with **laminated** vertical removable panels
3. Steel Shell Cab with **stainless** steel vertical removable panels

Paints and laminate to be selected from manufacturer's catalog of choices.  
Brushed Stainless Steel finished base plate located at top and bottom  
**(Brushed Stainless Steel finished vertical trim pieces optional).**

Premium Cab Options:

4. Steel Shell Cab with raised laminate hang on panels.
5. Steel Shell Cab with raised stainless steel hang on panels.

Laminate to be selected from manufacturer's catalog of choices.  
Brushed Stainless Steel finished base plate located at top and bottom

C. Car Front Finish: Satin Stainless Steel.

D. Car Door Finish: Satin Stainless Steel.

E. Ceiling Type: **[Select one]**

1. **[Ceiling]** Flat steel ceiling **[Select: <Real White (EWO)> or <Black (EW5)> or <Brushed Steel Finish>]** with 4 LED lights.

**[OR]**

2. **[Drop Ceiling]** Dropped flat steel ceiling **[Select: <Real White (EWO)> or <Black (EW5)> or <Brushed Steel Finish> or <Gold Satin Finish>]** with 6 LED lights.

**[OR]**

3. **[Drop Ceiling]** LED Perimeter-lit ceiling **[Select: <Real White (EWO)> or <Black (EW5)> or <Brushed Steel Finish> or <Gold Satin Finish>]**.

F. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

G. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

H. Handrail: Handrails shall be provided on the side and rear walls of the car enclosure. Handrails shall be 3/8" x 2" (9.5 mm x 51 mm) flat tubular handrail with a Brushed Steel or Gold Satin Finish. **Or** 1 1/2" diameter (38.1 mm) Round bar handrail with a Brushed Steel or Gold Satin Finish **Or** 1" x 1 15/16" (25.4 mm x 48.26 mm) Oval Handrail with a Brushed Steel Finish. **[Delete if No Handrail Option is selected.]**

I. Threshold: Extruded Aluminum **or** Bronze Finish **or** Nickel-Silver Finish.



- J. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- K. Guides: The car shall have 3” diameter roller guides at top and bottom and the counterweight shall have slide type guides at the top and the bottom.
- L. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.
- M. Certificate frame: Provide a Certificate frame with a satin stainless steel finish.
- N. The LED ceiling lights and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

2.5 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel.
  - 1. A car operating panel shall be furnished. It shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:
    - a. <Flat Flush Mounted satin stainless steel button with blue or white LED illuminating halo or gold satin button with white LED illuminating halo>
    - b. <1/8” (3mm) satin stainless steel projecting button with blue or white illuminating halo or gold satin button with white illuminating halo>
    - c. <Vandal-Resistant, Flush satin stainless steel button with blue LED illuminating center jewel>
    - d. <Lexan 1/8” (3mm) projecting fully illuminated button with white LED> (required by some local California codes)
- B. The car operating panel shall be equipped with the following features:
  - 1. Raised markings and Braille to the left hand side of each push-button.
  - 2. Car Position Indicator at the top of and integral to the car operating panel.
  - 3. Door open and door close buttons.
  - 4. Inspection key-switch.
  - 5. Elevator Data Plate marked with elevator capacity and car number.
  - 6. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
  - 7. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.  
Standard for USA, Optional in Canada
  - 8. In car stop switch (toggle or key unless local code prohibits use)
  - 9. Firefighter’s hat (standard USA)
  - 10. Firefighter’s Phase II Key-switch (standard USA)

- 11. Call Cancel Button (standard USA)
- 12. Firefighter's Phase II Emergency In-Car Operating Instructions: worded according to A17.1 2000, Article 2.27.7.2.

- C. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.
- D. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall have a **[This paragraph may be written as needed to indicate specific fixture finishes by opening. Clearly indicate landing/opening designations for each finish]**

Note: Integral Hall fixtures shall feature round stainless steel, mechanical buttons marked to correspond to the landings. Hall fixtures to be located in the entrance frame face **or** the wall. Buttons shall be in vertically mounted fixture. Fixture shall be satin stainless steel **or** Gold Satin finish.

Button Options:

<Flat Flush Mounted satin stainless steel button with blue or white LED illuminating halo or gold satin button with white LED illuminating halo>

<1/8" (3mm) satin stainless steel projecting button with blue or white illuminating halo or gold satin button with white illuminating halo>

<Vandal-Resistant, Flush satin stainless steel button with blue LED illuminating center jewel>

<Lexan 1/8" (3mm) projecting fully illuminated button with white LED> (required by some local California codes)

- E. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

**[Include the following options as required. Re-letter accordingly]**

F. **[Optional]** Access key-switch at top floor in entrance jamb.

G. **[Optional]** Access key-switch at lowest floor in entrance jamb.

H. **[Optional]** Card Reader Provision

PART 3 - EXECUTION

3.1 PREPARATION

- A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Installation of all elevator components, except as specifically provided for elsewhere by others, in accordance with manufacturer's instruction.

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: Temporary use is not allowed.

3.5 DEMONSTRATION

- A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION 142100



**SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to design, install and test a pressurized, fully supervised, wet or dry pipe fire protection system for full building protection in accordance with NFPA, IBC, the City of Portland Fire Department and the Owner's insurance underwriter. Areas subject to freezing shall have a dry pipe system, dry pendent or sidewall heads, or glycol-and-water loop per NFPA. Provide a 4" standpipe in each stairwell with a 2½" valve at each floor. Provide multiple risers, as required.
- B. Dry system loop from sprinkler room to the mechanical room. Convert to wet system throughout the building.
- C. Include ceiling mount dry heads at:
  - 1. Washington Ave Garage Entry Ceiling
  - 2. Covered Outdoor Restaurant area at Rear
- D. The sprinkler systems design shall be based on NFPA13 requirements.

**1.2 RELATED DOCUMENTS**

- A. The drawings and the specifications including Divisions 22, 23, 26 are hereby made a part of the work of this section.

**1.3 QUALIFICATIONS**

- A. The Fire Protection Work shall be performed by a qualified Contractor primarily engaged in the design and installation of Fire Protection Systems. The fire protection system design shall be performed under the direction of, and sealed by, a professional engineer registered in the State of Maine or NICET III certification.
- B. Welding qualifications of individuals installing welded piping shall be certified by the National Certified Welding Bureau for the type(s) of weld(s) proposed for use in piping assembly.

**1.4 SUBMITTALS**

- A. Items for which the submittal requirements of section 22 & 23, apply are as Follows:
  - 1. Hydrant flow test.
  - 2. System components.
  - 3. Hydraulic calculations.
  - 4. Piping layout, details and control diagram.
  - 5. Flushing and testing records.
  - 6. Certificate of installation.
  - 7. Copy of Fire Protection Contractors License.
  - 8. Welding certificates of individual welding technicians.
  - 9. Sprinkler heads.
  - 10. Alarm valve(s).
  - 11. Fire department connection(s).
  - 12. Firestopping materials and methods.

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Submit hydrant flow test, equipment descriptive data, hydraulic calculations and system layout for review by the Owner's Insurance Underwriter. Submit the system layout to the Architect for review. The Architect's review will be limited to checking for conformance with the design concept of the project and general compliance with the contract documents and will in no way assume liability for review for compliance with codes, standards and laws.

### 1.5 SPRINKLER COVERAGE

- A. Sprinkler head coverage shall conform with NFPA requirements for the use of the building. Coverage shall be increased accordingly where required by the Authority having jurisdiction.
- B. If the requirements of the inspection agency or the Owner's insuring agent are more rigorous than those stated herein, then the more rigorous requirements shall govern.

## PART 2 - PRODUCTS

### 2.1 SYSTEM COMPONENTS AND HARDWARE

- A. Pipe, Fittings, Joints, Hangers, Valves, Fire Department Connections, Alarms: Conform to NFPA-13, Installation of Sprinkler Systems.
- B. Sprinkler Heads:
  - 1. Interior Heated Spaces: Conform to NFPA-13, commercial quick response type. Provide semi-recessed type with white finish for acoustical tile ceilings. Sprinkler heads in GWB ceilings shall be "concealed" type. Dry pendent or sidewall heads, where required, may be standard response type.
  - 2. Provide a spare head cabinet with wrenches, the amount of spare heads for each orifice size, finish, temperature classification, pattern and length furnished in the project shall be in accordance with the following schedule:

<u>Sprinkler Heads on Project</u>	<u>Number of Spare heads of each type.</u>
Less than 300	6
300-999	12
1000 or more	24
  - 3. Provide head protection guards where required.
  - 4. Sprinkler heads in unheated areas shall be dry pendent or sidewall type, or served by a glycol and water loop or separate dry-pipe system.
- C. Fire Department Connection: Provide a 4" Storz connection or siamese connection (as verified with the local fire department) at a location coordinated with the local fire department and the Architect.

### 2.2 WATER SUPPLIES

- A. Conform to the requirements of NFPA-13, Installation of Sprinkler Systems.

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### 2.3 DEVICES

- A. Detection devices and associated low voltage and line voltage wiring both within the fire protection system and to the building Fire Alarm System shall be the responsibility of the Sprinkler Contractor.

### 2.4 BACKFLOW PREVENTER

- A. Provide AMES MODEL 2000.

### 2.5 PIPING SYSTEM IDENTIFICATION

- A. Piping system and valve identification and color coding shall be in accordance with ANSI.

### 2.6 ELEVATOR SHAFTS AND MACHINE ROOM

- A. Sprinkler elevator shafts and elevator machine room per NFPA and the Maine State Elevator Code.

### 2.7 CEILING CAVITIES

- A. Ceiling cavities above all suspended acoustical tile ceilings in corridor areas and certain other areas contain bundled electrical cables and individual wires and shall be sprinklered. Coordinate sprinkler requirements with the Electrical Drawings.

### 2.8 FLEXIBLE SPRINKLER HOSE FITTINGS

- A. Manufacturer: FlexHead Industries, Inc., Viking or Victaulic "Aquaflex".
  - 1. Contact: 56 Lowland Street, Holliston, MA 01746; Telephone: (800) 829-6975; Fax: (508) 893-6020; Email: [sales1@flexhead.com](mailto:sales1@flexhead.com); website: [www.flexhead.com](http://www.flexhead.com)
- B. Description: Flexible Sprinkler Hose Fittings for use in commercial suspended ceilings and sheetrock ceilings.
  - 1. Regulatory Requirements:
    - a. In accordance with NFPA 13.
- C. Product Performance Criteria:
  - 1. FM Approved for its intended use pursuant to FM 1637 Approval Standard for Flexible Sprinkler Hose with Threaded End Fittings.
  - 2. UL Listed for its intended use pursuant to UL 2443 Standard for Flexible Sprinkler Hose with Fittings for Fire Protection Service.
  - 3. Seismically qualified for use pursuant to ICC-ES AC-156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.
- D. Materials: FlexHead Commercial Sprinkler Connections.
  - 1. FlexHead Flexible Hose Assemblies and End Fittings:
    - a. Composition: 100% Type 304 Stainless Steel.
    - b. Straight Hose Assembly Lengths: 2ft length, Model #2024 or 3ft length, Model #2036.
      - 1. ¾ inch outlet.

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2. 175 psi maximum rated pressure.
  3. Fully welded non-mechanical fittings, braided, leak-tested with minimum 1 inch true-bore internal corrugated hose diameter.
  - c. Elbow Hose Assembly Lengths(For use in confined spaces): 2ft length, Model #2024E or 3ft length, Model #2036E.
    1. ¾ inch outlet.
    2. 175 psi maximum rated pressure.
    3. Fully welded non-mechanical fittings, braided, leak-tested with minimum 1 inch true-bore internal corrugated hose diameter.
2. FlexHead Ceiling Bracket:
- a. Composition: Type G90 Galvanized Steel.
  - b. Type: Direct attachment type, having integrated snap-on clip ends positively attached to the ceiling using tamper-resistant screws.
  - c. Flexible Hose Attachment: Removable hub type with set screw.
3. Do not use product where exposed, concealed only.

### 2.9 SPRINKLER SYSTEM ZONING

- A. The building shall have area zone alarms to connect to the building fire alarm panel (six (6) total zones: 1 below grade, 5 above grade). Each floor shall be a separate sprinkler system zone. Each zone alarm shall consist of a flow switch, isolation valve with tamper switch and other components per NFPA. See Architectural Drawings for additional information. Coordinate with the Portland Fire Department. Coordinate with the Electrical Contractor and Fire Alarm Contractor.

## PART 3 - EXECUTION

### 3.1 PIPING LAYOUT AND DESIGN

- A. System requirements, installation requirements, design, plans, and calculations: Conform to NFPA-13, Installation of Sprinkler Systems.
- B. Sprinkler piping shall be run concealed above ceilings in occupied areas where possible. Piping in other areas may be run exposed. Piping shall not be exposed in occupied spaces unless indicated on the drawings or accepted by the Architect.
- C. Pipe penetrations through walls and floors shall be in accordance with Section 23 05 00 – Common Work Results for HVAC. Traverse points of piping shall be escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible to occupancy. Penetrations through walls shall be sleeved in accordance with Section 23 05 00. Sleeves shall be provided by the Fire Protection Contractor.
- D. Coordinate design and layout with building structure and building systems. The work shown in the contract documents has precedence for space requirements. Work of other trades may be modified or moved only with permission of the trade involved. Costs associated with modifications or relocations shall be the same as for "Substitutions" Section 23 05 00.
- E. For areas with acoustical tile ceilings, sprinkler heads shall be located in the center of acoustical tiles. Coordinate with the Reflected Ceiling Plans. The Architect shall review the proposed system layout and reserve the right to relocate heads, substitute head system and in general review final layout for components visible in occupied spaces.



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### 3.2 SYSTEM ACCEPTANCE

- A. Approval, flushing, hydrostatic testing, instructions, and certificates of installation: Conform to NFPA-13, Installation of Sprinkler Systems.
- B. Disinfect the water piping in accordance with AWWA C601. Fill the piping systems with solution containing a minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Repeat disinfection if chlorine residual is less than 10 parts per million after 24 hours. Flush the solution from the systems with clean water until maximum residual chlorine contents is not greater than 0.2 parts per million.
- C. Closing in Work:
  - 1. General: Cover up or enclose work after it has been properly and completely reviewed.
  - 2. No additional cost to the Owner will be allowed for uncovering and recovering, work that is covered or enclosed prior to required review and acceptance.
- D. Cleanup and Corrosion Prevention:
  - 1. Upon completion of the work thoroughly clean and flush piping systems to the sewer with water.
  - 2. Piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.
  - 3. Before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces. When corrosion is from the effects of hot solder paste, the areas shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutralize the acid condition.
- E. Instructions: On completion of the project, provide a technician familiar with the system to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner.
- F. Warranty: For a period of one (1) year after completion of the installation repair or replace any defective materials or workmanship. Upon completion of the installation, the system shall be turned over to the Owner fully inspected and tested, and in operational condition.

### 3.3 FIRESTOPPING

- A. Firestopping shall be performed in accordance with Specification Section 07 84 00 "Firestopping". All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

\* END OF SECTION \*



**DIVISIONS 22 AND 23**

**REQUIREMENTS FOR MECHANICAL / PLUMBING WORK**

Systems Description and Performance Criteria for Design / Build Procurement

PART 1 - GENERAL

1.1 SUMMARY

- A. The Mechanical Contractor shall be responsible for the mechanical design and construction of the building and provide mechanical specifications and construction drawings stamped by a mechanical engineer licensed to practice in the State of Maine. The mechanical work includes providing all labor, materials, equipment, consumable items, supervision, administrative tasks, tests and documentation required to provide complete and fully operational mechanical systems. The mechanical contractor shall completely coordinate the work of this section with the work of other trades.
- B. The mechanical contractor shall file documents, obtain permits and licenses, pay fees and obtain necessary inspections and approvals from all applicable authorities that have jurisdiction.
- C. The mechanical contractor's work shall begin at the utility connection 5 feet outside the building foundation. Mechanical work shall be complete from point of service to each space with all accessory construction and materials required to make each item of equipment or system complete and ready for operation. Mechanical systems shall include the following:
  - 1. Apartments: all occupied spaces shall be heated/cooled with dedicated VRF energy recovery heat pump system(s), one condensing unit per apartment with dedicated interior units in each living room and bedroom wall mounted. exterior unit. Locations of exterior units shall be coordinated with Architect but in general can be located on the roof. Apartment ventilation will be provided by individual exhaust fans for kitchen cooking area. Wall caps to be placed on rear of building. Front apartment vents shall be run horizontally to the rear of the building and out through wall caps. Bathroom exhaust and supply air into the apartments shall be done by an air-to-air heat recovery unit located in closet on each floor off the main corridor. Top floor supply and exhaust shall be provided by packaged rooftop ERV located as directed by the Architect. kitchen hood(s) will be ducted to the rear of the building. The HVAC system shall allow simultaneous heating or cooling in any zone. The rooftop units shall be provided with water tight drain pans under entire exterior perimeter of equipment with a condensate overflow switch and alarm. Room temperature sensors shall be electronic and shall have a blank display without setpoint adjustment. Each apartment shall have dedicated unit(s). Common areas can consist of multiple spaces with similar solar exposure and occupancy. Zoning diagram shall be provided for review by engineer. New NG services including all piping shall be the responsibility of the MC. Each apartment will have clothes dryer vents that shall be installed by MC. Wall caps shall be on rear of building dryer exhaust booster fans may be required.
  - 2. Ground floor tenant spaces – Served by Packaged NG fired split systems with condensing units on the roof and will provide Heating/cooling and ventilation for the commercial tenant spaces.

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3. House space: Normally unoccupied areas such as stairwells and storage rooms shall be heated with cab heaters or unit heaters and ventilated per ASHRAE and IMC. Nat gas fired boiler installed in utility space wit hydronic pumps and piping system. Common areas can consist of multiple spaces with similar solar exposure and occupancy. Zoning diagram shall be provided for review by engineer. New NG services including all piping shall be the responsibility of the MC.
3. System design will be in conformance with the IECC, IBC, IMC, NFPA, ASHRAE and MUBEC Maine Energy Standards.

### Plumbing

1. The building shall be served by water and sewer utilities from the Portland Water District. Domestic water pressure booster system may be required contractor is responsible for verifying water pressure is sufficient to serve the building loads or provide a booster pump system. Complete operational system shall be supplied and installed to maintain adequate water pressure at top floor apartments. Coordinate with water/sewer district with architectural floor plans. Plumbing fixtures shall be provided as indicated on the Architectural drawings and shall comply with the Maine State Plumbing Code. Fixture type and manufacturer will be selected by Architect. Apartment bathrooms toilets shall be tank type, tub/showers and sinks shall be approved by architect. All fixtures will be water-conserving type and ADA-compliant where applicable. Floor drains shall be provided in the toilet / shower rooms and at the water service and in the mechanical room. Provide electronic trap primers by PPP, Inc. or Zurn for each floor drain and pipe to each floor drain trap. A minimum of four (4) exterior frost-proof sillcocks shall be provided. Coordinate locations with the Owner and Architect. ADA showers shall have hand held showerhead, fold-up seat and grab bars per ANSI. Fixed head showers shall be 1.5 GPM. The shower threshold shall be  $\frac{3}{4}$ ". The domestic water heaters shall be electric one for each apartment located in a closet. The domestic hot water system shall be recirculated by an all-bronze or stainless steel circulator. Water hammer arrestors shall be provided where required. Plumbing fixtures see Appendix A.
2. Provide elevator sump pump and associated piping system.
3. Provide roof drains as indicated on the Architectural drawings and roof drain piping as required. Provide overflow roof drains and piping as required. Roof drains shall be Zurn or equal.
4. Provide floor drain and/or sump pump in Car Storage Area.

### 1.2 SUBMITTALS

- A. The following information shall be submitted to the Architect in a timely manner allowing for review and revision as may be necessary before work is begun:
  1. Name, address and telephone number of the Maine licensed mechanical engineer.
  2. Detailed engineering documents, drawings and specifications, as prepared and stamped by the engineer of record.
- B. Manufacturer's product data and installation instructions for each material and product proposed for use in areas exposed to view.

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### PART 2 - DESIGN CRITERIA

- A. Load Calculations: Shall be performed in accordance with procedures and methods as described in ASHRAE Handbook of Fundamentals and ASHRAE GRP-158 Cooling and Heating Load Calculation Manual. Loads shall be calculated for each zone of control, for each air system, and for the building total peak load.

1. General Data:

Weather Data Location - Portland, ME

Latitude: 44°

Outdoor Design Temperatures:

Winter: -10°F

Summer: 86°F dry bulb/72°F wet bulb (coincident)  
74°F wet bulb

Building hours of operation: 24 hours/day, 7 days/week, or as specified by the Owner.

Internal Gain:      Lighting: as designed  
                          Equipment: as scheduled  
                          People: 315 BTUH sensible, 325 BTUH latent

Indoor Temperature and Relative Humidity (conditioned spaces only):

Relative humidity: 25-60%RH

Summer (conditioned spaces only): 75°F

Winter: 70°F

Population Density: per ASHRAE standards for occupied spaces or as provided by the Owner.

Ventilation Rate: ASHRAE Standard 62.

Roof: R-Value 35 – Confirm/coordinate with Architectural details/assemblies

Exterior Walls: R-Value 21 Confirm/coordinate with Architectural details/assemblies.

Windows / Glass: U-Value .25 Confirm/coordinate with Architectural details/assemblies.

Infiltration: 1/2 air change/hr minimum, not coincident with ventilation load. Confirm/coordinate with Architectural details/assemblies.

B. System Design:

1. Zones of Control: Each major use area or exposure shall constitute an independent thermostatically-controlled zone. Each major space will be individually zoned and temperature controlled – proposed zones. Provide supplemental perimeter heat where required (vestibule, restrooms, storage spaces, lounges, etc.).
2. Air Device Selection: Diffusers shall be selected to provide the design airflow in each zone. One, two, three, or four way patterns may be used. The diffuser shall be selected such that the room noise criteria (Nc) does not exceed the scheduled values, and the diffuser throw results in room air velocities less than 50 FPM and greater than 20 FPM in the occupied zone.

Manufacturers catalog data throw data shall be corrected for actual ceiling height. Manufacturer's noise data shall be adjusted to delete any arbitrary credit taken for room absorption, and shall be corrected to reflect the actual number of diffusers in the space an actual room absorption. Return grilles shall be selected using the same noise limitations outlined for diffusers. Air device performance ratings shall be Air Diffusion Council (ADC) certified.

3. Low Pressure Ductwork: Shall be designed for a maximum pressure drop of 0.08" WG per 100 ft. of duct. Acoustical duct liner (Armaflex SA) shall be applied to rectangular ductwork as required to assure that design room noise (Nc or RC) levels are not exceeded.
4. Piping: Water piping shall be sized for a maximum velocity of 4 ft./sec. Piping systems shall be designed within the criteria indicated in the ASHRAE Handbooks.
5. Energy Recovery Unit: Shall be sized to provide the peak building ventilation air quantity at the static pressure calculated.
6. Pumps: Taco, Wilo, Bell and Gossett or Grundfos with variable speed control. Select pumps so that the operating point on the selected impeller-curve will lie at or to the left (shut-off side) of, and not more that 5 percent below, the point of maximum efficiency for the impeller. Selected catalog data submitted for approval shall include pump speed and characteristic curve for performance of impeller selected for each pump. Curves shall indicate capacity vs head, efficiency, and brake horsepower for full range, from shut-off to free delivery.
7. Acoustical considerations: Sound-producing HVAC equipment shall not be located in or adjacent to acoustically sensitive areas.
8. Exhaust Fans: Shall be provided for ventilation of all bathrooms, janitor closets, and special exhaust. Fans shall be sized for double code required ventilation. Fans shall be selected such that the specified acoustic levels are not exceeded in the occupied spaces.
9. Automatic Temperature Control - Furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the automatic temperature control system indicated and be connected to the Owner's building management system. The system shall be Direct Digital Control to provide the sequences as described below. The ATC system shall be complete including required components including, low voltage and line voltage wiring.
  - a. Rooftop AHU:
    - 1) The unit shall operate continuously.
    - 2) Discharge Air Temperature Control: Shall be determined by the central control panel and space temperatures.
    - 3) Economizer Cooling: When the outside air conditions are suitable, the enthalpy economizer shall function for natural cooling. The heat wheel shall stop when in economizer mode.
    - 4) Freeze Protection: A manual reset freezestat located in the discharge ductwork (in the heated space) shall shut down the fan

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and close the outside air damper if the discharge supply temperature falls below 45°F (adjustable).

- 5) Duct smoke detectors in the discharge and return air shall de-energize the unit and close the outside air dampers. The smoke detector shall be wired to interface with the building fire alarm system.

- b. Exhaust Fans: Toilet rooms shall have an exhaust fan on low speed continuously and wall switch to ramp up to higher level.

### 10. Return Air Ductwork:

- a. Return air shall be ducted directly from each space. Return air plenums shall not be used.

## PART 3 PRODUCTS

### 3.1 PIPING MATERIALS

- A. Heating hot water piping: CPVC or PEX or Type L hard copper tubing with cast bronze or wrought copper solder fittings or Schedule 40 carbon steel pipe. Fittings for steel pipe are as indicated in paragraph "Fittings for Steel Pipe".
- B. Chilled Water piping: CPVC or PEX or Type L hard copper tubing with cast bronze or wrought copper solder fittings or Schedule 40 carbon steel pipe. Fittings for steel pipe shall be as indicated in paragraph "Fittings for Steel Pipe".
- C. Soil and Waste (Sanitary) and Vent Piping: Cast iron with push-on joints below grade. Cast iron "no Hub" above grade. Sanitary piping shall be cast iron. Vent piping may be PVC at contractor's option, cast iron (ONLY) thru roof.
- D. Domestic Water Piping:
  1. Above Slab: PEX or Schedule 40 CPVC, Flowguard Gold with solvent-welded joints, or equal, or Type L hard copper tubing and cast bronze or wrought copper solder fittings. Piping concealed in walls may be PEX.
- E. Exposed Water and Waste Piping at Fixtures: I.P.S. copper with cast brass fittings chrome plated finish, with deep one piece escutcheon plates at traverse points.
- F. Solder: Lead-free (ONLY), Englehard Silvabrite 100, 440°F melting point, ASTM B32.

### 3.2 VALVES

- A. Ball Valves:
  1. 1/2" thru 2" copper, Apollo Model 70-203 thru 70-208.
  2. 1/2" thru 2" IPS, Apollo Model 70-103 thru 70-108.
  3. 1½" thru 4" IPS, Victaulic style 721.
- B. Gate Valves: Nibco.
  1. 1/2" thru 2", copper, Model S-113.
  2. 1/2" thru 2-1/2" IPS, Model T-113.

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### C. Check Valves:

1. 1/2" thru 2" copper, Nibco Model S-413.
2. 1/2" thru 2" IPS, Nibco Model T-413.
3. 2" thru 4" IPS, Victaulic series 712.

### D. Butterfly Valves:

1. 2½" thru 6", 150 psi working pressure, Centerline or Norris. Lug type, iron body, 316SS disc and shaft, Buna-N seat.

### E. Outside Screw and Yoke (OS&Y) Gate Valves: Nibco Class 250 Model F-667-0, iron body, flanged.

## 3.3 FITTINGS FOR STEEL PIPE

### A. Fittings in sizes 1/2" through 2": Steel or malleable iron with requirements as follows:

1. Steel fittings socket welding or screwed type conforming to ANSI B16.11.
2. Malleable iron fittings screwed type conforming to ANSI B16.3.
3. Victaulic rolled or cut grooves with rigid couplings and flexible couplings where required for expansion.

### B. Fittings in sizes 2½" and larger:

1. Butt welding type conforming to ANSI B16.9.
2. Flanged type conforming to ANSI B16.5.
3. Victaulic rolled or cut grooves with rigid coupling and flexible couplings where required for expansion.

### C. Steel Flanges: Forged steel, welding type conforming to ANSI B16.5. Bolting and gaskets shall be as follows:

1. Bolting: Material used for bolts and studs shall conform to ASTM A 307, Grade B, and material for nuts shall conform to ASTM A 194, Grade 2. Dimensions of bolts, studs, and nuts shall conform to ANSI B18.2.1 and ANSI B18.2.2 with threads conforming to ANSI B1.1 coarse type, with Class 2A fit for bolts and studs, and Class 2B fit for nuts. Bolts or bolt-studs shall extend completely through the nuts.
2. Gaskets: Gaskets shall be of a material that resists attack by the fluid or gas in the pipeline and shall be suitable for the pressure and temperature ranges encountered. Gaskets shall be as thin as the finish of surfaces will permit. Raised-face steel flanges shall have ring gaskets with an outside diameter extending to the inside of the bolt holes. Gaskets shall have an inside diameter equal to or larger than the port openings.

### D. Butt Weld Joints: Shall conform to ANSI B31.1. The use of backing rings shall conform to ANSI B31.1. Ferrous rings shall be of weldable quality and shall not



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exceed 0.05 percent sulfur. Backing rings shall be of the continuous machined or split band type.

### 3.4 HANGERS

- A. Adjustable Swivel Hanger: Carpenter and Paterson Fig. 800 or Clevis hanger Carpenter and Paterson Fig. 100.
- B. Riser Clamp: Carpenter and Paterson Fig. 126 for steel pipe and Fig. 126 CT for copper tube.

### 3.5 PIPING SPECIALTIES

- A. Thermometers: Hot Water and Chilled Water Service - Trerice, No. V80445, or Ashcroft with a 4½" diameter face. System thermometers shall have a range of 30°F to 240°F (hot water) or 0-100°F. (chilled water) with 2° increments. Provide with brass thermometer wells projecting a minimum of 2" into the pipe with extension to face of insulation.
- B. Pressure Gauges: Gauges shall be 3½" case, Trerice Series 800, or Ashcroft installed with shut off petcock, 0-100 psig.
- C. Expansion Tanks: Taco Model CA butyl bladder type expansion tank, full acceptance volume, ASME rated for 125 psig working pressure and 240°F maximum temperature, air-charging fitting, drain fitting.
- D. Strainers: 125 psig minimum rating wye strainers, with blowdown valve; as manufactured by Sarco or Barnes and Jones.
- E. Automatic Air Vents: Armstrong air vent traps No.1-AV 1/2" with stainless steel trim. Other acceptable manufacturers are Amtrol, Sarco or Hoffman. Valves shall be installed with each vent. Drains from the vents shall be run to the nearest indirect waste.
- F. Manual Air Vents: Consist of air chamber with a 3/8" pipe off the top and a 3/8" ball valve. The valve shall be installed in an accessible location. An air chamber shall be installed at each air vent and shall be line size for piping smaller than 2" and 2" for larger piping.
- G. Pumps: Taco, Wilo, Grundfos or Bell and Gossett in-line centrifugal pumps, cast iron body, bronze fitted, 1750 rpm, 175 psig working pressure, 250°F working temperature, flanged connections. Motors shall be premium high efficiency with variable speed with differential pressure control.
- H. Balancing Valves: Armstrong circuit setter.
  - 1. Balancing devices shall have provisions for connecting a portable differential pressure gauge. Each balancing device to be sized to provide a differential pressure reading between 2 and 5 feet with the valve full open at design flow rates.
  - 2. Install per manufacturer's recommendations for adjacent length of straight pipe.
  - 3. Balancing devices shall have memory stops for use as a tight shutoff without disturbing the balancing setting.

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4. Balancing devices shall have drain connections with shutoffs.
  5. Shop drawings shall indicate gpm, size, wide open differential pressure meter reading, and actual water pressure drop.
- I. Flexible Connectors:
    1. Pumps: Mason Industries Model MFTNC neoprene connectors, rated at 150 psig and 220°F.
  - J. Triple Duty Valve: Taco "Plus One" combination gate, check and balancing valve with metering connections, cast iron body, 175 psig working pressure. Valves shall be sized to provide a differential pressure reading between 2 and 5 ft. with the valve full open at design flow rates.
  - K. Water Pressure Reducing Valve: Watts Regulator Series USB with thermal expansion bypass, integral stainless steel strainer, 140°F maximum temperature, 175 psig working pressure, 25 to 75 psi reduced pressure range.
  - L. Backflow Preventer: Watts Regulator Series 909 double check valve backflow preventer, 175 psig working pressure, 210°F working temperature, bronze body, stainless steel seats, shafts and bolts.
  - M. Air Separator: Taco Model 4900AD dirt and air separator, screwed or flanged connections, 125 psig design pressure.
- 3.6 CABINET UNIT HEATERS (CUH)
- A. Cabinet unit heaters shall be manufactured by Sterling. The cabinet shall be 16 gage steel, factory prime coated, and enamel finished with color selection by Architect. Furnish two, throw-away type, filters for each heater. Heaters shall be equipped with permanent split capacitor motors suitable for 120 volt, 60 cycle, single phase current. Motors shall have automatic reset integral thermal overload protection, extended motor oilers, and shall be high efficiency type for ducted units (high static pressure). Coils shall be of seamless copper tube mechanically expanded into aluminum fins. Coils shall be tested for leaks at 300 psig. Furnish with unit-mounted speed switch (3-speed). Units shall be concealed with ducted connections, semi-recessed, inverted airflow, or wall-mounted, inverted airflow as scheduled on drawings.
- 3.7 HORIZONTAL UNIT HEATERS
- A. Sterling, hot water coils single tube, single serpentine, totally enclosed motors. Sizes and capacities as required. Ratings as required. Electric: 120V-1PH-60HZ.
- 3.8 PIPE INSULATION
- A. Hot Water and Chilled Water Piping and Equipment: Knauf or Johns-Manville, heavy density fiberglass with thermal conductivity of 0.29 BTU-in/hr-ft<sup>2</sup>-°F at 150°F mean temperature. Insulation shall be suitable for 1000°F service. Pipe fitting insulation shall be same material used for pipe.
  - B. Domestic Hot Water, Cold Water, Roof Drain Piping and Equipment: Knauf or Johns-Manville, heavy density fiberglass with thermal conductivity of 0.29

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BTU-in/hr-ft<sup>2</sup>-°F at 150°F mean temperature. Insulation shall be suitable for 1000°F service. Pipe fitting insulation shall be same material used for pipe.

- C. Insulation Jacket: All service (ASJ) type, with maximum flame spread of 25, fuel contribution of 50 and smoke developed of 50 (ASTM E84). Jacket permeability shall not exceed 0.02 perms (ASTM E96). Pipe fitting jacket shall be molded PVC covers with pressure sensitive taped joints.
- D. See "Execution" section for insulation thickness.

### 3.9 DUCT INSULATION AND ACOUSTIC LINING

- A. Duct Insulation: Fiberglass duct wrap with foil-scrim-kraft facing/vapor barrier, 1.0 lb/cu.ft. density, 0.29 but-in/hr-sf-°F conductivity, 0.05 permeance rating, fire hazard classification (flame/fuel/smoke) 25/50/50. Insulation shall meet the requirements of NFPA 90A & B and shall be UL rated.
- B. Acoustical Duct Lining: Acoustic lining and insulation: Armstrong Type SA "Armaflex" closed cell, installed in accordance with the manufacturers recommendations.

### 3.10 SHEETMETAL WORK AND MATERIALS

- A. Low Pressure Ductwork (Static Pressure  $\leq$  2" WG):
  - 1. Rigid Ductwork: Galvanized steel conforming to ASTM A527, weight of galvanized coating shall be not less than 1-1/4 ounces total for both sides of one sq. ft. of a sheet. Construction, metal gage, and reinforcements shall conform with SMACNA "Duct Construction Standards" and NFPA 90A for 1" W.G. pressure class for exhaust ductwork, return ductwork.
  - 2. Low Pressure Flexible Ductwork: Wiremold Type "WG" with 1" thick thermal insulation. The duct shall be suitable for working pressures up to 10" WG.
  - 3. Access Doors: Ruskin Model ADC2, 10"x10" size, 24 gauge galvanized steel, steel on both sides of door, foam gasket seals, 1" insulation, 4 cam locks, no hinge.
  - 4. Turning Vanes: Solid, single blade, mounted with the long edge down stream.
  - 5. Spin-in Fittings: General Environmental Corporation "Genflex" Model SM-2DE or Model SM-2DEL.
  - 6. Manual Balancing Dampers: Ruskin Model MD-35 opposed blade with locking quadrant.
- B. Access Doors:
  - 1. Low Pressure Duct Systems: Ventlok 10" x 12" or as indicated with #99 Ventlok cam locking latches and no hinge.
- C. Automatic Control Dampers:
  - 1. Automatic dampers not furnished as an integral part of an item of equipment shall conform to this paragraph. Automatic dampers shall be constructed and

installed in accordance with the following Minimum Standards and shall be Arrow "Arrow-Foil" Model PBDAF-206, OBDAF-207 or Ruskin Model CD-50:

- a. Damper Blades: Automatic dampers, including dampers for static pressure control, shall be of the balanced type, factory-fabricated, with fully gasketed extruded aluminum airfoil blades, mounted in welded frames. Damper blades shall be not more than 8 inches wide, shall have interlocking edges and be capable of operation against 4" static pressure differential.
  - b. Proportioning Dampers: Proportioning dampers shall be of the opposed blade type.
  - c. Damper Size and Bearings: Damper blades shall have steel trunnions mounted in oil-impregnated bearings. Dampers shall be not more than 48 inches in length between bearings.
  - d. Frames: Damper frames shall be of welded channel or angle-iron, with heavy steel corner gussets and braces or stiffened with steel tie-rods where necessary. Frames shall be painted with aluminum paint to prevent rusting.
  - e. Dampers shall be guaranteed to close tight, and shall provide substantially the full area of the opening when open. Outdoor air intakes and exhaust ducts to outside and fresh air, return air and exhaust air dampers in systems shall have damper blades with inflatable seals or other devices to guarantee low leakage, not to exceed 6 CFM/SF at 1 in. WG pressure differential.
  - f. Damper Linkages: Damper-operating links shall be steel or brass rods, adjustable in length with ball and socket joints and of such proportions that they will withstand, without appreciable deflection, a load equal to not less than twice the maximum operating force of the damper motor. Linkages shall be concealed in the frame.
- D. Louvers: Ruskin ELF-6375DX, box frame, for masonry walls, drainable blade, extruded aluminum construction. Provide 1/2" expanded metal bird screen on interior. Louver finish shall be Kynar 500, color selected by Architect. Coordinate sizes, shapes and locations with the architectural drawings. Pitch duct connecting to louver toward outside to facilitate draining. Seal duct water tight at connection point to louver. Refer to architectural drawings for further details.
- E. Fire Dampers: Ruskin Model IBD2 curtain type with blades out of the airstream, 1½ Hr. rated in accordance with UL and NFPA requirements in all horizontal and vertical penetrations.
- F. Volume Extractors: Anemostat Model DTA, adjustable, with worm gear operator accessible thru the branch opening. Unit shall be suitable for tight shut-off.
- G. Flexible Collars and Connectors: Ventfabrics, Inc. "Ventglass" neoprene coated glass fabric.
- H. Joint Sealant: For ductwork that is not visible from finished spaces, use Hardcast, Inc., type DT5300 gypsum impregnated tape and Model FTA-20 activator/adhesive for indoor applications.

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### 3.11 FANS

- A. Fans shall be Greenheck, Cook Ventilator, or Penn Ventilator. Fans shall be furnished with a safety switch or other suitable disconnect switch and backdraft damper or motorized damper. Provide 12" high insulated roof curbs and curb seals.

### 3.12 GRILLES, REGISTERS AND DIFFUSERS (Price, Krueger, Titus or Metalaire)

- A. Ceiling Diffusers: Square neck louver faced with "lay-in" type frame (Krueger Model DL) for acoustic tile ceilings and or flanged frame (Model DF), for drywall ceilings pattern as required.
- B. Return Grilles: Rectangular neck, 45° curved blade 1/2" blade spacing, for acoustic the ceilings (Model SAC35LD), or 3/4" blade spacing for acoustic ceilings (Model SAC3LD), 3/4" blade spacing with flanged frame for drywall ceilings (Model S3HD), and 1/2" blade spacing with flanged frame for plaster ceilings (Model S35HD). Straight blade, 3/4" spacing, flanged frame (Model S3HS).
- C. Exhaust Grilles: Square neck, 45° curved blade 1/2" spacing, aluminum construction.
- D. Transfer Grilles: Square neck, 45° curved blade 1/2" spacing with lay-in frame (Model SAC35LD) or flanged frame (Model S35HD).
- E. Supply Register: Rectangular neck, double deflection, front blades horizontal, steel construction with 1/2" blade spacing (Model S25HO) or 3/4" blade spacing (Model S2HO). Registers shall be provided with opposed blade balancing dampers.
- F. Supply Grille: Square neck, double deflection, steel construction, front blades horizontal, 1/2" spacing (Model S25H), or 3/4" spacing (Model S2HO).

### 3.13 ROOFTOP AIR HANDLING UNITS

- A. Greenheck, Cook, or equal. Sizes, types and performance shall be as required. The supply air shall be conditioned to the space requirements. Units shall be provided with a non-fused disconnect switch, magnetic motor starters, controls, hot water heating coil(s), chilled water cooling coils and dampers, roof curbs, piping vestibules and filter sections. Nameplates shall be fixed to the unit. Installation and maintenance bulletin shall be supplied with each unit. Locations of units including service access requirements shall be coordinated with the Architect during design.
- B. Cabinet:
  - 1. Unit cabinet shall be insulated, weatherproof and designed to operate at a total static pressure up to 4.5". Furnish with intake and exhaust hoods.
  - 2. Exterior panels of sections shall be double-wall construction with 18-gauge or heavier galvanized steel exterior sheetmetal and 22 gauge (minimum) interior liner. Access doors downstream of the supply air fan section shall include 20-gauge galvanized steel door liners. (Galvanized steel liners shall be provided on access doors and over floor insulation in traffic areas.)
  - 3. Hinged, latched and gasketed access doors shall be provided for each section.
- C. Supply Air Fan Section:

1. Supply fans shall be double width, double inlet centrifugal, forward curved (FC), airfoil (AF), backward curved (BI) type. Fans shall be statically and dynamically balanced for quiet operation. The forward curved fan wheel and housing shall be fabricated from steel. Backward curved and airfoil fan wheels shall be Class II type and fabricated from aluminum with the fan blades continuously welded to the back plate and end rim, and shall operate in a galvanized steel housing. Units shall have solid steel shafts mounted in heavy-duty greasable ball bearings. The entire fan assembly shall be completely isolated from the unit bulkhead with neoprene gasketing and mounted on double deflection spring isolators.
  2. Fan motors shall be heavy-duty, 1800 RPM, open drip-proof type with greasable ball bearings, operating at 60 Hz, 3 phase. Motors shall be premium high efficiency. The motors shall have a variable pitch sheave and be mounted on an adjustable base for proper alignment and belt tension adjustment.
- E. The filter section shall be supplied with galvanized steel filter racks as an integral part of the unit. Filters shall be accessible from both sides of the unit. The prefilter section shall be provided with panel filters. Panel prefilters shall be MERV8, 2" thick throwaway pleated media type mounted in a galvanized steel filter frame. The panel filter section shall be designed for face velocities not to exceed 380 FPM. Filters shall be rigid 2" thick extended media disposable type, MERV8 of 40% efficiency as tested by ASHRAE test standard 52-76. Filters shall have a minimum average arrestance of 95% in accordance with that standard.
- F. Submit fan curves for each fan with the design operating point clearly marked.
- G. Submittal data shall include sound power data for inlet, discharge and radiated sound. CAUTION: Submittals without this data will be rejected.

3.14 FANCOIL UNITS

- A. Trane, McQuay or Envirotech, 4-pipe, with hot water heating and chilled water cooling coils, ducted arrangement, filters, drain pan and condensate overflow switch. Units shall be insulated and have a high external static pressure motor, ECM, or equal.

PART 4 EXECUTION

4.1 DESIGN AND INSTALLATION OF PIPING SYSTEM

- A. Provide and erect in accordance with the best practice of the trade piping system required to complete the intended installation. Make offsets as required to place piping in proper position to avoid other work and to allow the application of insulation and finish painting to the satisfaction of the Owner.
- B. The size and general arrangements, as well as the methods of connecting piping, valves, and equipment, shall be as designed, or so as to meet the requirements of the Owner.
- C. Piping system shall be erected so as to provide for the easy and noiseless passage of fluids under working conditions. Inverted eccentric reducing fittings shall be used whenever water pipes reduce in size.

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- D. Water mains shall be run level or pitch slightly upward so that no air pockets are formed in the piping. The mains shall be set at elevations such that the runouts feeding equipment shall have no pockets where air can collect except where vents are provided. Provide drains at low points in the piping systems.
- E. Piping shall be run concealed above ceilings in occupied areas.
- F. In the design of water piping, make proper allowances for expansion and contraction. Piping shall be anchored as necessary to control expansion. Loop water runouts to units shall come off the main downward or off the side with a minimum of two 90° elbows provided on runout from main.
- G. Install stop valves and unions to facilitate maintenance and removal of equipment.
- H. Steel piping 2" and smaller shall have screwed connections, or Victaulic connections. Threads on piping must be full length and clean-cut with inside edges reamed smooth to the full inside bore. Close nipples shall not be used.

Pipe threads shall be standard pipe threads, machine cut and full length. Pipe shall be reamed to remove burrs and up-ended and rapped to dislodge dirt and scale. Joint compound shall be applied to male thread only. If necessary to back off a screwed joint after it is made, the thread shall be cleaned and new compound applied. Caulked threads will not be permitted.

- I. Steel Piping 2½" and larger shall have welded connections or Victaulic couplings.
  - 1. Welded Joints:
    - a. Welding Procedure: Before any welding is performed, submit copies of welding procedure for metals included in the work together with proof of qualification as outlined in ANSI B31.1.
    - b. Performance Qualification Record: Before any welder or operator shall perform any welding, submit 2 copies of the Welder's Performance Qualification Record in conformance with ANSI B31.1 showing that the welder was tested under the approved procedure submitted. In addition also submit each welder's assigned number, letter, or symbol which shall be used to identify the work of the welder, affixed to the joint immediately upon completion of the weld. Welders making defective welds after passing a qualification test shall be given a requalification test and upon failing to pass the test shall not be permitted to work on this project.
    - c. Previous Qualification: Welding procedures, welders and welding operators previously qualified by test may be accepted for this project without requalification subject to approval of the Owner and provided that the conditions delineated in ANSI B31.1 are met before a procedure can be used.
    - d. Surface Conditions: Welding shall not be done when the atmospheric temperature is less than 0 degrees F, when the surfaces are wet, when rain or snow is falling or moisture is condensing on the surfaces to be welded, nor during periods of high wind, unless the welder and the work are protected properly. At temperatures between 32 degrees and 0 degrees F, the surfaces for an area within 3 inches of the joint to be welded shall be heated with a torch to a temperature warm to the hand

before welding. Surfaces to be welded shall be free from loose scale, slag, rust, paint, oil and foreign material. Joint surfaces shall be smooth, uniform, and free from fins, tears and other defects which might affect proper welding. Slag shall be removed from flame cut edges to be welded by grinding, temper colors need not be removed. Each layer of weld metal shall be cleaned thoroughly by wire brushing prior to inspection and deposition of additional weld metal.

- e. Base Metal Preparation: Preparation of pipe ends shall be done by machining and/or grinding, except that oxygen or arc cutting will be permitted on carbon steel pipe only if the cut is reasonably smooth, true and heavy oxide is thoroughly cleaned from the flame cut surfaces by grinding.

The ends of pipe-to-pipe, and pipe-to-fitting, joints shall be aligned accurately within a tolerance of twenty percent of the pipe thickness. Alignment shall be maintained during welding by suitable clamps, jigs, tack welds, or other devices. If tack welds are used to maintain alignment, they shall be kept below the outside surfaces of the pipe and shall not exceed twice the pipe thickness in length or two thirds the pipe thickness in depth, shall be the same quality as the final welds, and shall be fused thoroughly in the final weld. Defective tack welds shall be removed before the final weld is made.

- f. Quality of Welds: The quality of welds shall be in accordance with ANSI B31.1. The surface of the finished welds shall have a bright metallic luster after cleaning, shall be fairly smooth with regular, even ripples, and shall be uniform in contour. Except as necessary to correct defects, the surfaces shall not be dressed, smoothed, or finished for improving their appearance. Welds shall be sound throughout and fused thoroughly, and shall be free from gas pockets, oxides, slag inclusions, and surface porosity, except that very small pores or specs of oxides or slag will be allowed if dispersed widely and if not larger or more numerous than those produced in passing qualification tests. Welds shall be free from overlaps, undercuts and excessive convexity. The inside of the pipe shall be free from blobules of weld metal which would restrict the pipe area or might become loose.

- g. Correction of Defects: Defective or unsound welds shall be corrected by removing and replacing the welds with new welds, or as follows:

- 1) Excessive convexity - chip or grind weld to required size.
- 2) Undercutting, shrinkage cracks, craters, blowholes, and excessive porosity - chip or grind weld to sound weld and base metal and deposit additional weld metal.
- 3) Undersize and excessive concavity - clean weld and deposit additional weld metal.
- 4) Overlapping and lack of fusion - remove weld by chipping or grinding and reweld.
- 5) Slag inclusions - chip or grind weld to remove slag and fill with weld metal.



- 6) Removal of adjacent base metal during welding - chip or grind weld to sound base and weld metal and form full size by depositing additional weld metal. Pipe or fittings which cannot be rewelded satisfactorily shall be replaced with new pipe or fittings at the Contractor's expense. Caulking of welds shall not be done. Before adding weld metal or rewelding, the surfaces shall be cleaned thoroughly. The removal of weld metal from a defective weld shall not extend into the base metal beyond the weld penetration. Where incomplete fusion is disclosed by chipping or grinding to correct defects, the part of the weld shall be removed and rewelded. In chipping or grinding welds, the weld or base metal shall not be nicked or undercut.

2. Victaulic Joints:

- a. Pipe Preparation: Pipe shall be prepared in accordance with the latest published Victaulic specifications.
  - 1) Standard Weight Pipe: Shall be roll grooved without metal removal or square cut grooved.
  - 2) Plain End for FIT: pipe ends shall be thoroughly cleaned on the OD, for 1" from the pipe end to remove pipe coatings, mill scale, rust and raised weld beads, OD burrs and sharp edges shall be removed. Pipe shall be marked 1-1/2" from the end, and pipe end configuration shall be in conformance with Victaulic specifications.
- b. Assembly: Couplings, fittings, valves and pipe shall be assembled in accordance with latest published manufacturer's instructions.
  - 1) Pipe: pipe shall be checked to be certain it is sufficiently free of indentations, projections, grooves, weld seams, or roll marks on the exterior of the pipe over the entire gasket, that pipe ends are square cut and that preparation (grooving, cleaning, hole cutting) is in accordance with Victaulic pipe preparation standards.
  - 2) Gasket: gaskets shall be of the central cavity pressure-responsive design. Gasket style and elastomeric material (grade) shall be checked to be certain gasket supplied is suitable for the intended service.
  - 3) Lubrication: Use manufacturer's recommended lubricant. Lubrication shall be used for proper coupling/fitting assembly as follows: A thin, uniform coat of Victaulic Lubricant shall be applied by brush or by hand by: 1) brushing lubricant on the gasket lips (ID) and the entire exterior of the gasket; 2) brushing lubricant on the pipe ends around the entire pipe circumference and inside with coupling housing.

J. High points in water piping shall be provided with manual vents.

K. Connections between copper and steel piping shall be made with brass fittings.

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- L. Thermometers shall be installed in common supply to zones and in each separate circuit return. Install thermometer wells for thermometers projecting a minimum of 2" into the pipe with extension to face of insulation. Piping 2" and smaller shall be enlarged to 1½" where wells are installed.
- M. Solder joints shall be made with Harris Stay-Safe 50 lead free solder. Clean surfaces to be soldered and use a paste flux. Wash joints with sodium bicarbonate and water to remove corrosive effects of heated solder paste. Hot wipe solder at each fitting. Lead bearing solder is not permitted.
- N. Points of traverse of piping through walls and floors shall be through pipe sleeves of the same material and thickness as the pipe. Sleeves shall be of the next clearance size. Traverse points of piping shall be escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible to occupancy. Insulation shall be continuous thru sleeves.

### 4.2 PIPE HANGERS

- A. Copper Tubing: supported at intervals as follows, with rod sizes as follows, double nuts on hangers and on beam clips.

Copper Size	Hanger Intervals	Rod Sizes
1/2"	5'	3/8"
3/4"	6'	3/8"
1"	6'	3/8"
1-1/4"	7'	3/8"
1-1/2"	8'	3/8"
2"	9'	3/8"
3"	10'	3/8"

- B. Iron Pipe: supported at intervals and with rod sizes as follows, double nuts on hangers and on beam clips.

Iron Pipe	Hanger Intervals	Rod Sizes
1/2"	6'	3/8"
3/4"	6'	3/8"
1"	7'	3/8"
1-1/4"	7'	3/8"
1-1/2"	9'	3/8"
2"	10'	3/8"
2-1/2"	11'	3/8"
3"	12'	3/8"
4"	14'	1/2"

- C. Verticals: supported at not more than 16 ft. intervals by use of clamp hangers.

### 4.3 INSULATION OF PIPING AND EQUIPMENT

- A. Insulate heating hot water, domestic hot water, roof drain piping and chilled water supply and return piping, condensate piping, equipment, valves and fittings. Fittings shall be mitered fiberglass insulation segments of same thickness as adjacent insulation. Fitting and valve body insulation shall be covered with molded PVC fittings covers. Secure overlap at cover throat with stainless steel tacks. Tape joints with pressure sensitive vapor barrier tape.
- B. Hangers: On insulation shields.

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- C. Unions shall be covered as are fittings but shall have collared enlargement at least 1" larger than the OD of the line insulation.
- D. Pipe Insulation Thickness:
  - 1. Hot Water and Chilled Water Supply and Return:
    - a. **2" and smaller piping - 1" thick.**  
**2½" and larger piping and equipment - 1½" thick.**
  - 2. Domestic Cold Water Piping:
    - a. **2" and smaller piping - 1" thick.**  
**2½" and larger piping and equipment - 1½" thick.**
  - 3. Domestic Hot Water and Recirculated Hot Water:
    - a. **2" and smaller piping - 1½" thick.**
  - 4. Roof Drain Piping:
    - a. **1" thick.**

**4.4 DESIGN AND INSTALLATION OF DUCTWORK AND AIR DEVICES**

A. Provide and erect in accordance with the best practice of the trade ductwork required to complete the intended installation. Make offsets required to place ductwork in proper position to avoid conflicts with other work and to allow the application of insulation and finish painting to the satisfaction of the Owner. Ductwork design shall be accomplished to avoid conflict with architectural and structural design elements. If conflicts cannot be resolved by the Design-Build mechanical contractor, coordinate a solution with the Architect during the design phase. Ducts shall be arranged to adjust to "field conditions". The Sheet Metal trades shall coordinate his work with other trades. Work shall conform to ASHRAE duct construction recommendations, SMACNA "Duct Construction Standards," NFPA, and the requirements of the International Mechanical Code.

B. Construction for Low Pressure Round and Rectangular Ductwork:

- 1. Metal Gauge:
  - a. Thickness of metal for low pressure rectangular ducts, including elbows and other fittings, shall be as follows:

Longest Rectangular Dimension of Duct <u>Inches</u>	Galv. Steel & Stainless Steel <u>USS Gauge</u>
Up thru 12	26
13 thru 30	24
31 thru 54	22
55 thru 84	20
Over 85	18

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- b. Thickness of metal for low pressure round ducts, including elbows and other details, shall be as follows:

Duct Diameter Inches	Galv. Steel USS Gauge
Up thru 10	24
11 thru 20	22

2. Round Duct: Use properly sized and beaded male couplings (ONLY). Assembly shall be made in accordance with the manufacturer's recommendations and sealed airtight with the manufacturer recommended duct sealer. The joints shall be fastened in place by three or more sheet metal screws spaced not over eight inches apart.
3. Longitudinal Seams: Longitudinal joints in ducts shall be Pittsburgh lockseams (ONLY). CAUTION: Button punch lock joints are not acceptable.
4. Transverse Joints and Bracing Angles: Transverse joints and bracing angles of rectangular duct shall be as follows:

Duct Size Long Side Inches	Transverse Joints	Bracing Angles Size - Inches	Flat Bar
18 or less	Hemmed S slip	None	None
19 thru 30	Hemmed S slip	1" x 1" x 1/8" @ 60"	1" x 3/16"
31 thru 42	1" Reinforced Bar Slip	1" x 1" x 1/8" @ 60"	1-1/4" x 1/4"
43 thru 60	1-1/2" Reinforced Bar Slip	1-1/2" x 1-1/2" x 1/8" @ 60"	1-1/2" x 1/4"
61 thru 96	1-1/2" Angle Re- inforced Pocket Lock	1-1/2" x 1-1/2" x 3/16" @ 30"	1-1/2" x 1/4"

5. Transverse Joints: Drive slips shall be used on short sides of transverse duct joints if side is less than 24 inches. Metal and thickness of S slips and drive slips shall be same as duct. Ends of drive slips shall be bent over at least 1/2 inch at corners. Bar slips shall be fastened with sheet metal screws on 12 inch centers. Corners of bar slip joints shall be folded over and riveted. Pocket slips shall be riveted to duct on 6-inch centers, and corners shall be overlapped and riveted.
6. Stiffeners: Ducts over 18 inches wide shall be provided with stiffeners, which may be either transverse joints or angle bracing, as indicated above. The center-to-center spacing of stiffeners shall be not over four feet for ducts not exceeding 60 inches (long side) and shall be not over two feet for ducts not exceeding 8 feet in any case. Flat area of uninsulated ducts over 18 inches wide shall be stiffened by cross-breaking. Uninsulated exposed ducts shall

have flat bar reinforcement and flush seams in lieu of bracing angles and projecting seams.

7. Bracing Angles: Bracing angles shall be of the same metal as the duct. Angles shall be riveted to the ducts on 6-inch centers, and shall be applied on four sides. On vertical ducts, set of bracing angles shall be located with heel down at the floor line wherever duct passes through floor. End of two opposite angles shall extend as required to catch floor construction.
  8. Long Radius Elbows: Long radius elbows shall be constructed with a throat radius equal to not less than the dimensions of the duct width in the plane of the duct turn. Where space does not permit the use of a long radius elbow, vanned mitered elbows shall be provided.
  9. Mitered Elbows: Low pressure mitered (square) elbows shall be constructed with single wall turning vanes. A 12" x 12" access door shall be installed adjacent to each elbow with turning vanes.
- D. Joint Sealing:
1. Low Pressure Ductwork: lateral duct joints and clinch connections shall be sealed to SMACNA seal Class B.
  2. Pressure Taps: Provide near end of each duct run, between components of air handling systems and as required by the Air Balance Subcontractor, pressure taps of 1/4" copper tube, soldered to duct or plenum, and provided with neoprene cap to prevent air leakage. Where required, also provide taps for velocity traverse equipment.
- E. Turns shall be made with long radius elbows.
- F. Field Changes to Ductwork: Field changes of ducts such as those required to suit the sizes of factory-fabricated equipment actually furnished shall be designed to minimize expansion and contraction. Use 4:1 transitions in field changes as well as modifications to connecting ducts.
- G. Deflectors: Provide deflectors in duct-mounted supply outlets, take-off or extension collars to supply outlets, and tap-in branch-off connections. Adjust supply outlets to provide air volume and distribution as indicated.
- H. Fire Dampers: Install fire dampers for ducts penetrating fire-rated walls or floors.
- I. Access Doors: Provide access doors for automatic dampers, counter balanced dampers, volume dampers, fire dampers, coils, thermostats, temperature controllers, valves, filters, and other concealed apparatus requiring service and inspection in the duct system.
- J. Duct Sleeves and Prepared Openings: Install duct sleeves and prepared openings for duct mains, duct branches, and ducts passing through walls, roofs, and ceilings. Ensure the proper size and location of sleeves and prepared openings. Allow one-inch clearance between duct and sleeve or one-inch clearance between insulation and sleeve for insulated ducts, except at grilles, registers, and diffusers.
- K. Closure Collars: Provide closure collars of not less than 4 inches wide on each side of walls or floors where sleeves or prepared openings are installed. Fit collars snugly around ducts and insulation. Grind smooth edges of collar to preclude tearing or

puncturing insulation covering or vapor barrier. Use nails with maximum 6-inch centers on collars.

- L. Duct Supports: Provide duct supports of not less than two one-inch by 1/16 inch galvanized strip-iron hangers spaced one on each side of ducts. Anchor risers in the center of the vertical run to allow ends of riser free vertical movements. Attach supports only to structural framing members and concrete slabs. Anchor supports to metal decking only if a means is provided for preventing the anchors from puncturing the metal decking. Where supports are required between structural framing member, provide suitable immediate metal framing. Where C clamps are used, use retainer clips.
- M. Flexible Collars and Connections: Provide flexible collars between fans and ducts or casings and where ducts are of dissimilar metals. For round ducts, securely fasten flexible connections by zinc-coated steel clinch-type draw-band. For rectangular ducts, lock flexible connections to metal collars.
- N. Longitudinal joints shall be Pittsburgh Hammered Lockseam.
- O. Transitions with a slope greater than 4 to 1 will be ordered removed from the system and replaced with a transition which meets this criteria.
- P. Installation of Air Devices:
  - 1. Curved blade transfer grilles installed in vertical walls above the line of sight shall be installed with the blade opening facing the ceiling.
  - 2. Curved blade transfer and return grilles installed in ceilings shall be installed with the blade opening facing the nearest wall.
  - 3. Ductwork visible to the occupants thru the face of supply, return, transfer grilles or diffusers shall be painted with flat black paint.

#### 4.5 INSULATION OF DUCTWORK

- A. Insulate the concealed supply air ductwork from the Energy Recovery Ventilator units to the diffusers with 1½" thick fiberglass duct wrap with a factory applied "FSK" vapor barrier facing. Laps to be sealed and held in place with sealing tape adhesive and flared staples (sealing tape shall be SMACNA approved). On the bottom of the ducts 24" and wider, mechanical fasteners shall be provided approximately 12" on center.
- B. Acoustically line ductwork as required to meet the occupied space acoustic criteria listed (10' minimum downstream / upstream of all fans). Lining shall be applied to the interior of the ductwork. Acoustic liner shall be applied to the flat sheet metal with adhesive and fabricated in the break. Provide stick clips on 12" centers for additional support in ducts over 12" wide. Liner shall be Armaflex Type SA.

#### 4.6 CLOSING IN UNINSPECTED WORK

- A. General: Cover up or enclose work after it has been properly and completely inspected and reviewed.
- B. If any of the work is covered or enclosed prior to required inspections and acceptance, uncover the work as required for the test and inspection. After inspection, tests and acceptance, repairs and replacements shall be made by the

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appropriate trades with such materials as necessary for the acceptance by the Engineer and at no additional cost to the Owner.

### 4.7 TEST AND ADJUST

- A. Supply and return piping shall be tested with water to a pressure of 75 psi and held for a period of two hours. Any leaks shall be repaired and another test applied to the piping. Piping shall be tested before it is insulated.
- B. Before operating the system the piping shall be flushed out to remove oil and foreign materials.
- C. After the installation is complete and ready for operation, the system shall be tested under normal operating conditions in the presence of the Engineer and demonstrated that the system functions as designed.
- D. It shall be demonstrated that the piping systems have free and noiseless circulation of water and that parts including packing glands are tight.
- E. If any defects in operation develop during the test periods, correct them immediately and additional tests will then be conducted.

### 4.8 CLEANING

- A. Prior to acceptance of the work, thoroughly clean exposed portions of the installation, removing labels and foreign substance.

### 4.9 INSTRUCTIONS

- A. On completion of the project, provide a competent technician to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not be less than eight (8) hours.

The time of instruction shall be arranged with the Owner. In addition to the prime HVAC Contractor, the control system Contractor, Balancing Contractor, and Owner's representative shall be present and participate in the Owner's instruction.

### 4.10 EQUIPMENT IDENTIFICATION

- A. Each pump, unit heater, fan, damper motor, water circulating pump switch and control device shall be identified with plastic laminated identification tags. Labels and tags shall be Setmark or Seton. "Dymo" type tags are prohibited. Set points shall be indicated on tags.

### 4.11 TESTING, ADJUSTING AND BALANCING

- A. At the conclusion of the installation, the air and water systems shall be tested, adjusted and balanced by certified balancing technicians to provide the required design air and water flow rates. A testing and balancing report shall be delivered to the Owner for review.

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### **4.12 PROPYLENE GLYCOL**

- A.** The chilled water system shall be filled with a 40% aqueous solution of propylene glycol and water. The propylene glycol shall be Dowfrost, or equal, with long-life corrosion inhibitors.



## APPENDIX A PLUMBING FIXTURES

Loft powder room sinks: Kohler Persuade Curv K-2956 w/ Console Table

Bathroom Undermount Sinks: Kohler Verticyl K-882

Guest Bathroom Faucets: Grohe Concetto 34270

Master Bathroom Faucets: Grohe Essence 20297 (to be used in units with only 1 bathroom)

Kitchen Sinks: Elkay Crosstown 30179

Kitchen Faucet: Moen Align 7565

Kitchen Sink: Elkay Crosstown 30179

Kitchen Faucet: American Standard Quince

*Bar Sink:* Elkay Crosstown 12179

*Bar Faucet:* Moen Align 7565

# ELKAY<sup>®</sup>

## SPECIFICATIONS

### Crosstown™ Undermount Single Bowl Sink Model ECTRU12179

**GENERAL**

Highest quality sink fabricated of #18 (1.2mm) gauge, type 304 (18-8) nickel bearing stainless steel. Undermount.

**DESIGN FEATURES**

Bowl Depth: 9" (229mm).

Coved Corners: Approximately 5/8" (15mm).

Finish: Exposed surfaces have a Polished Satin Finish.

Underside: Fully protected by heavy duty Sound Guard<sup>®</sup> undercoating designed to reduce condensation and dampen sound.

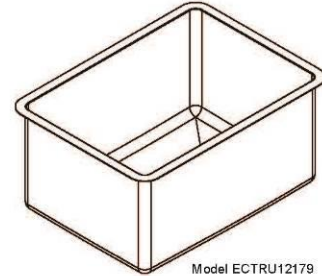
**OTHER**

Drain Opening: 3-1/2" (89mm).

NOTE: All Elkay undermount sinks are designed to attach to the underside of any solid surface countertop.

Sink complies with ASME A112.19.3/ CSA B45.4.

 Sinks are listed by IAPMO<sup>®</sup> as meeting the applicable requirements of the Uniform Plumbing Code<sup>®</sup>, International Plumbing Code<sup>®</sup>, and National Plumbing Code of Canada.



Model ECTRU12179

**OPTIONAL ACCESSORIES**

Bottom Grid: GFOBG1217SS

Cutting Board: LKCBF17-HW

Mounting Clips: LKUCLIP8

Rinsing Basket: LKFRB715SS

Utensil Caddy for Rinsing Basket: LKWUCSS

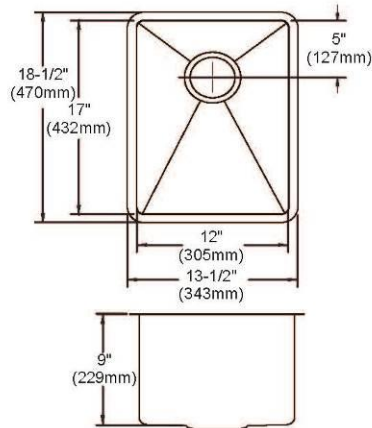
Drain: LK35, LK99

**SINK DIMENSIONS\***

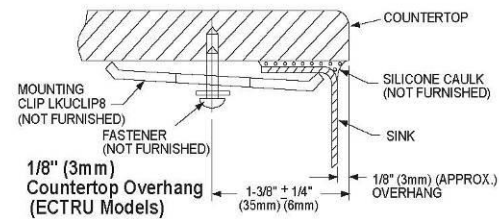
Model Number	Overall		Inside Bowl			Cutout in Countertop	Minimum Cabinet Size
	L	W	L	W	D		
ECTRU12179	13 1/2" (343mm)	18 1/2" (470mm)	12 (305mm)	17 (432mm)	9 (229mm)	See Template**	18 (457mm)

\*Length is left to right. Width is front to back.

\*\*Template is packed with every sink.



Installation Profile of ECTRU Models  
The template provided with each ECTRU sink provides the only type of installation recommended by Elkay



In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit [elkayusa.com](http://elkayusa.com) for most current version of Elkay product specification sheets.

This specification describes an Elkay product with design, quality and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

**Elkay**  
elkay.com  
elkaypro.com

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Oak Brook, IL 60523

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(Rev. 12/13) SPEC00005

For all Lavatories with exception to the Powder Rooms



**VERTICYL™**

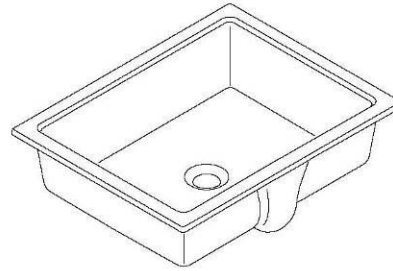
**Features**

- Vitreous china
- Under-mount
- With overflow
- Without faucet hole(s)
- Includes 1193643 clamp assembly
- 17-1/4" (438 mm) x 13" (330 mm)



**UNDER-MOUNT BATHROOM SINK  
K-2882**

**ADA**



**Codes/Standards Applicable**

Specified model meets or exceeds the following:

- ADA
- ASME A112.19.2/CSA B45.1
- ICC/ANSI A117.1

**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-2882	Under-mount bathroom sink	<input type="checkbox"/> 0	<input type="checkbox"/> Other_____
Recommended Accessories			
K-8998	Adjustable P-Trap	<input type="checkbox"/> CP	<input type="checkbox"/> Other_____

**Product Specification**

The under-mount bathroom sink shall be made of vitreous china. Bathroom sink shall be 17-1/4" (438 mm) in length and 13" (330 mm) in width. Bathroom sink shall be with overflow and without faucet hole(s). Bathroom sink shall include 1193643 clamp assembly. Bathroom sink shall be Kohler Model K-2882-\_\_\_\_\_.

## VERTICYL™

### Technical Information

Fixture*:	
Basin area	17-1/4" (438 mm) x 13" (330 mm)
Water depth	3-1/8" (79 mm)
Drain hole	Ø 1-3/4" (44 mm)
* Approximate measurements for comparison only.	
Cutout template	
	1109226-7
Included components:	
Basin clamp assembly	1193643

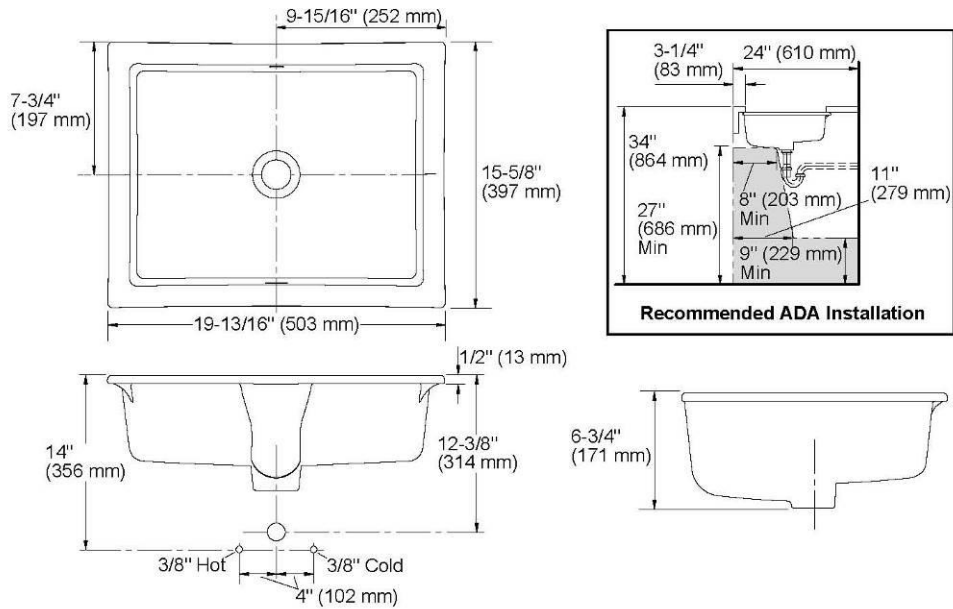
### Installation Notes

Install this product according to the installation guide.

**NOTICE:** Countertop manufacturer or cutter must use the current product template available at [www.kohler.com](http://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.

For under-mount installation, countertop thickness cannot be greater than 1" (25 mm) for ADA compliance.



### Product Diagram

VERTICYL™ UNDER-MOUNT BATHROOM SINK  
Page 2 of 2  
1109225-4-E

THE BOLD LOOK  
OF **KOHLER.**

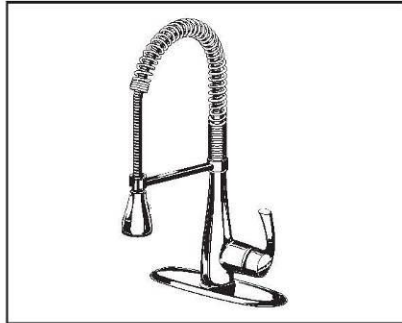






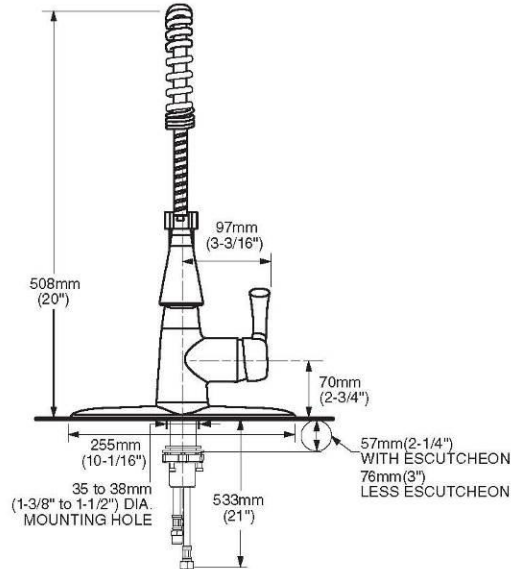
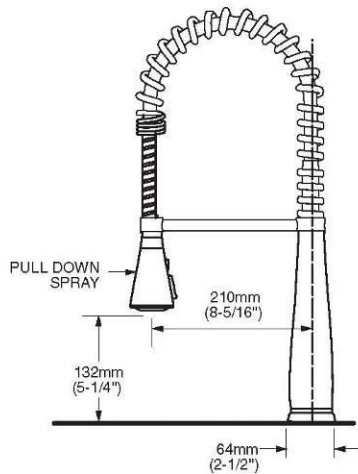


**QUINCE™**  
SEMI-PROFESSIONAL KITCHEN FAUCET



**MODEL NUMBER:**

- 4433.350 Semi-Professional Kitchen Faucet
- 4433.350.F15 Semi-Professional Kitchen Faucet



**GENERAL DESCRIPTION:**

Metal handle, escutcheon plate and swivel spout (150° rotation). Adjustable spray pattern with toggle button activation. Metal reinforced hose with Stainless Steel protector coil. Washerless 40mm ceramic disc valve cartridge. Braided flexible Stainless Steel supply hoses with 3/8" compression connections. Metal mounting shank with brass fixation ring. Complete with two integral check valves. 2.2 gpm/8.3 L/min. maximum flow rate, 1.5 gpm/5.7 L/min. maximum flow rate for F15 models. Fitting can be mounted with or without escutcheon plate (escutcheon size 10-1/16"L x 2-1/2"W).

**PRODUCT FEATURES:**

**Ceramic Disc Valve Cartridge:** Assures smooth, precise valve control and a lifetime of drip-free, maintenance-free performance.

**Memory Position Valving:** Allows user to turn valve on and off at preferred temperature setting without readjusting handle position each time.

**Lead Free:** Faucet contains ≤ 0.25% total lead content by weighted average.

**Integral Check Valves:** Prevents back flow.

**Toggle Spray Function:** Switches water flow from a stream to a spray and includes pause feature.

**SUGGESTED SPECIFICATION:**

Single control semi-professional kitchen faucet shall feature a metal swivel spout with two check valves, metal escutcheon plate and handle. Shall also feature washerless ceramic disc valve cartridge and flexible Stainless Steel supply hoses. Faucet shall be American Standard Model # 4433.350.



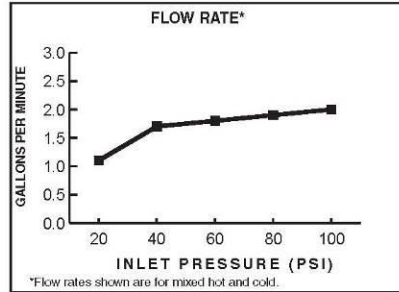


**QUINCE™**  
SEMI-PROFESSIONAL KITCHEN FAUCET

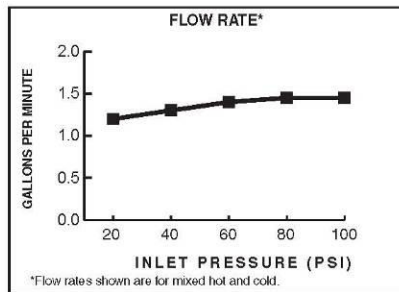
**CODES AND STANDARDS**

These products meet or exceed the following codes and standards:

- ANSI A117.1
- ASME A112.18.1
- NSF 61/Section 9 & Annex G
- CSA B125



2.2 gpm/8.3 L/min. FLOW RATE



1.5 gpm/5.7 L/min. FLOW RATE

Product Number	Description	Finish Options	
		Polished Chrome	PVD Stainless Steel
4433.350	Semi-Professional Kitchen Faucet - 2.2 gpm/8.3 L/min. maximum flow rate	002	075
4433.350.F15	Semi-Professional Kitchen Faucet - 1.5 gpm/5.7 L/min. maximum flow rate		

Meets the American Disabilities Act Guidelines and **ANSI A117.1** Requirements for the physically challenged.



Buy it for looks. Buy it for life.®

# Specifications

### FAUCET DESCRIPTION

- Reflex™ pulldown system offers smooth operation, easy movement and secure docking
- Metal construction with various finishes identified by suffix
- Quick connect installation
- Pulldown spray with 68" braided hose
- Flexible supply lines with 3/8" compression fittings
- High arc spout provides height and reach to fill or clean large pots while pulldown wand provides the maneuverability for cleaning or rinsing
- 360° rotating spout provides ability to install handle on either side
- Faucet designed for handle to be mounted on right side

### OPERATION

- Lever style handle
- Temperature controlled by 100° arc of handle travel
- Operates with less than 5 lbs. of force
- Operates in stream or spray mode in the pullout or retracted position

### FLOW

- Flow is limited to 1.5 gpm (5.7 L/min) max at 60 psi

### CARTRIDGE

- 1255™ Duralast™ cartridge

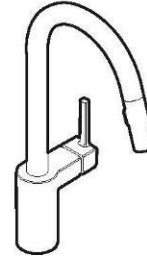
### STANDARDS

- Third party certified to IAPMO Green, ASME A112.18.1/CSA B125.1 and all applicable requirements therein including NSF 61/9G
- 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

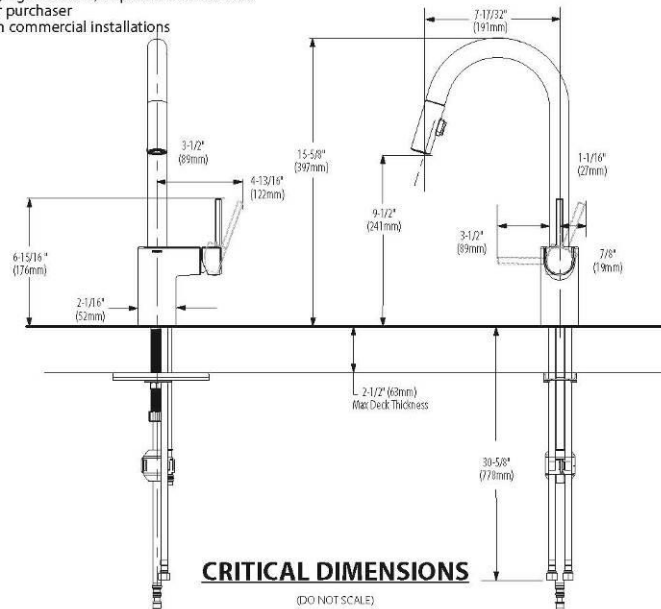
- Lifetime limited warranty against leaks, drips and finish defects to the original consumer purchaser
- 5 year warranty if used in commercial installations



**ALIGN™**  
Single Handle High Arc  
Pulldown Kitchen Faucet

Models: 7565 series

**NOTE:** THIS FAUCET IS DESIGNED TO BE INSTALLED  
THRU 1 HOLE, 1-1/2" (38mm) MIN. DIA..  
(OPTIONAL 3-HOLE ESCUTCHEON 141002 AVAILABLE)





# ELKAY<sup>®</sup>

## SPECIFICATIONS

### Crosstown™ Undermount Single Bowl Sink Model ECTRU30179R

**GENERAL**

Highest quality sink fabricated of #18 (1.2mm) gauge, type 304 (18-8) nickel bearing stainless steel. Undermount.

**DESIGN FEATURES**

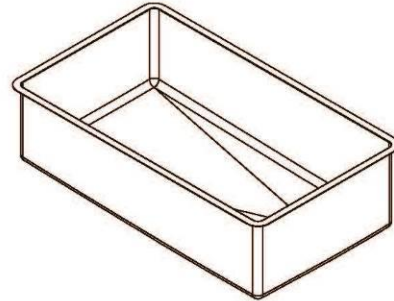
Bowl Depth: 9" (229mm).  
Coved Corners: Approximately 5/8" (15mm).  
Finish: Exposed surfaces have a Polished Satin Finish.  
Underside: Fully protected by heavy duty Sound Guard<sup>®</sup> under-coating designed to reduce condensation and dampen sound.

**OTHER**

Drain Opening: 3-1/2" (89mm).  
NOTE: All Elkay undermount sinks are designed to attach to the underside of any solid surface countertop.

Sink complies with ASME A112.19.3/ CSA B45.4

 Sinks are listed by IAPMO<sup>®</sup> as meeting the applicable requirements of the Uniform Plumbing Code<sup>®</sup>, International Plumbing Code<sup>®</sup>, and National Plumbing Code of Canada.



Model ECTRU30179R

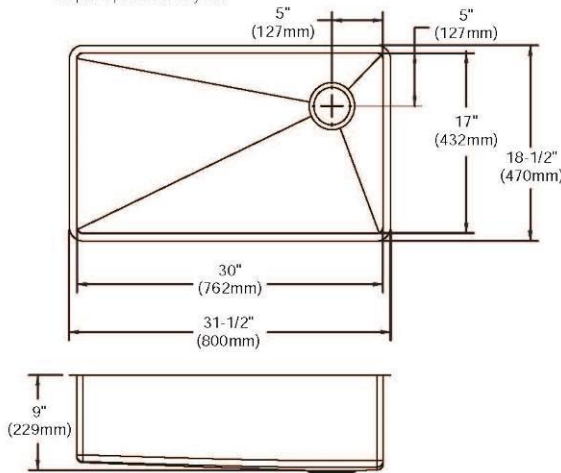
**OPTIONAL ACCESSORIES**

- Bottom Grid: GFOBG3017RSS
- Cutting Board: LKCBF17HW
- Mounting Clips: LKUCLIP8
- Rinsing Basket: LKWERBSS
- Utensil Caddy for Rinsing Basket: LKWUCSS
- Drain: LK35, LK99

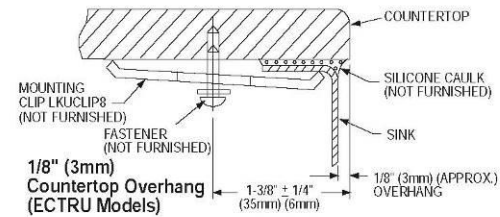
**SINK DIMENSIONS\***

Model Number	Overall		Inside Bowl			Outlet in Countertop	Minimum Cabinet Size
	L	W	L	W	D		
ECTRU30179R	31 1/2" (800mm)	18 1/2" (470mm)	30" (762mm)	17" (432mm)	9" (229mm)	See Template**	36" (914mm)

\*Length is left to right. Width is front to back.  
\*\*Template is packed with every sink.



Installation Profile of ECTRU Models  
The template provided with each ECTRU sink provides the only type of installation recommended by Elkay



In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit [elkayusa.com](http://elkayusa.com) for most current version of Elkay product specification sheets.

This specification describes an Elkay product with design, quality and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

**Elkay**  
elkay.com  
elkaypro.com

2222 Camden Court  
Oak Brook, IL 60523

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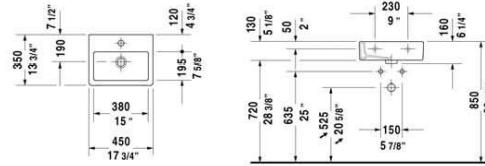
221 Congress Street





Furniture handrinse basin # 070445

|< 17 3/4" Inch >|



Furniture handrinse basin	Dimension	Weight	Order number
with overflow, with tap platform, cUPC listed, fixings included, 17 3/4" Inch			
<b>Colors</b>			
00 White 08 Black			
<b>Variant</b>			
Sanitary ceramics with the special WonderGliss surface finish will remain clean and attractive-looking for a long time to come. When ordering WonderGliss please add a "1" as eleventh digit to the model number.			
Space-saving siphon			005073
<b>Suitable products</b>			
Vanity unit wall-mounted 1 door, for Vero # 070445 (not ground), 15 3/4" x 12 5/8" Inch	15 3/4" x 12 5/8" Inch		KT6630 L/R
Vanity unit wall-mounted 1 door, for Vero # 070445 (not ground), 15 3/4" x 13" Inch	15 3/4" x 13" Inch		XL6209 L/R
Vanity unit wall-mounted 1 door, for Vero # 070445 (not ground), 15 3/4" x 12 1/4" Inch	15 3/4" x 12 1/4" Inch		VE6271 L/R

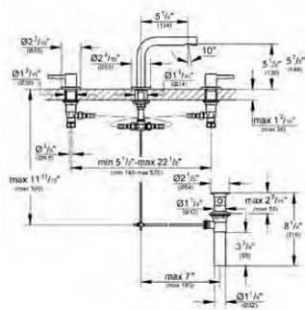
All drawings contain the necessary measurements which are subject to standard tolerances. They are stated in inch & mm and are non-binding. Exact measurements, in particular for customized installation scenarios, can only be taken from the finished ceramic piece.

Powder and Master Bathroom Faucets

ESSENCE  
 Three-hole basin mixer 1/2"  
 S-Size  
 MODEL # 20297

GROHE America, Inc | 200 North Gary Avenue, Suite G, Roselle, IL 60172  
 Phone: +1 (800) 444-7643 | Fax: +1 (800) 225-2778 | us-customerservice@grohe.com

Pure Freude an Wasser



**Product Description:**  
 Three-hole basin mixer 1/2"  
 S-Size

**Standard Specification:**

- GROHE StarLight® finish
- GROHE EcoJoy® technology for less water and perfect flow
- Tubular spout
- Integrated flow control
- 3/4" ceramic cartridges (90° turn)
- 1 1/4" pop-up waste set
- Quick installation system
- Union nut with 7/16" drilling
- Pressure resistant flexible connection hoses (between spout and side valves)
- Max Flow Rate 1.5 gpm at 60 psi (5.7 L/min)

**Applicable Codes & Standards:**

- Energy Policy Act of 1992
- NSF 61
- ASME A112.18.1/CSA B125.1
- US Federal and State material regulations
- EPA WaterSense®
- ICC/ANSI A117.1

**Color:**

- ☐ 20297 000 chrome
- ☐ 20297 EN0 Brushed Nickel

221 Congress Street





**DIVISION 26000**

**REQUIREMENTS FOR ELECTRICAL WORK**

Systems Description and Performance Criteria for Design/Build Procurement

PART 1 - GENERAL

1.1 SUMMARY

- A. The electrical contractor shall be responsible for the electrical design and construction of the building and provide electrical specifications and construction drawings stamped by an electrical engineer licensed to practice in the State of Maine. The electrical work includes providing all labor, materials, equipment, consumable items, supervision, administrative tasks, tests and documentation required to provide complete and fully operational electrical systems. The electrical contractor shall completely coordinate the work of this section with the work of other trades.
- B. The electrical contractor shall file documents, obtain permits and licenses, pay fees and obtain necessary inspections and approvals from all applicable authorities that have jurisdiction.
- C. The electrical contractor's work shall begin at the utility supplied transformer secondary side. Electrical work shall be complete from point of service to each outlet, fixture or device with all accessory construction and materials required to make each item of equipment or system complete and ready for operation. Electrical systems shall include the following:
  - 1. Complete power distribution system:
    - a. Underground electrical service shall be 120/208V, 3 phase, 4 wire. Service size shall be determined by electrical design/build contractor based on information provided. Each apartment shall have a dedicated electrical meter, two retail tenant meters and one house meter. Meter stack shall be in the basement electrical room. Service will be underground - transformer vault underside walk and excavation by site contractor. All conduits by EC included primary and secondary. Site drawings have been developed by Blais Civil Engineers showing utility information. Electrical contractor shall install secondary conductors from the pole mounted transformer that will feed the building. Meter stack will be located in the basement electrical room. One meter for each apartment and one retail space and one house. Main distribution equipment shall be located in electrical room in the basement. See architectural plans developed by Caleb Johnson Architects for location.
    - b. Required subpanels for the apartments shall be sized and located, supplied and installed by EC. Each apartment and retail space shall have its own panel minimum.
    - c. Apartments shall have receptacles per NEC "Dwelling unit" requirements. Arc fault protected, Ground fault protected, tamper proof etc.
    - d. All units GF were applicable per NEC. Other large load, 120V equipment shall have 20A dedicated circuits. All circuits shall have separate neutrals.
    - e. Provide power to HVAC roof mounted and interior equipment air handling, cooling and heating unit(s), exterior condensing units, pumps, boilers, miscellaneous building equipment, and temperature control (120v) power as needed by the mechanical contractor. Loads and drawings will be provided by mechanical design build contractor.

- f. Provide power for laundry equipment.
  - g. Provide power for automated Parking system Architect can provide information on power requirements.
  - h. Power for automatic door operators see architectural plans.
  - i. All wiring for door access systems.
2. Complete exterior lighting system including fixtures, wiring, lamps, controls, trim and accessories. Exterior lighting shall be controlled by photocell/time clock combination. Building wall packs to be controlled separately from light poles. Pole bases and excavation by site contractor; conduits and wire by EC.
  3. Complete interior lighting system including fixtures, wiring, lamps, motion sensor controls in bathrooms and common areas, trim and accessories. Lighting system shall include battery backed up LED exit signs & emergency lighting in egress paths under power outage condition. Lighting levels to meet IES standards for this type of occupancy. See Prescribed allowances.
  4. CCTV and building security system supplied by others. Provide 120V power and conduit system for control panel location to be coordinated with security system installer.
  5. Provide temporary power and lighting during construction and until the project is accepted as substantially complete by the owner. Coordinate temporary power and light requirements with the general contractor.
  6. Provide qty (2) (RG6) cable TV cable and jack/plate – in each living room and each bedroom. Provide media box and power in closet all apartments. Run cable to telephone and CATV main entry points or distribution closets on each floor.
  7. Complete addressable fire alarm systems designed and installed by EC for the entire facility. Building is fully sprinkled. EC shall supply and wire required number of flow switches & tamper switches- to be coordinated with Sprinkler Contractor. EC shall wire air compressor & alarms for complete installation. The building shall be equipped with a fire alarm system that is monitored by an approved fire alarm company. The system shall have remote annunciator panels located at all main entrances and per the Portland FD. Alarms can be silenced with the push of one button from each annunciator location. The strobe or other visual alarm signaling devices shall remain active when the system is silenced. The alarm system shall identify the exact location of each individual initiation device with plain text at the fire alarm panel. The building shall be equipped with a knox box(s) at locations approved by the fire department. The key box shall be electronically connected to the fire alarm system to show a trouble signal whenever the box is in the open position. The building shall meet the requirements of the National Fire Protection Association. Sprinkler system to be designed by Sprinkler contractor to comply with NFPA..
  8. Provide power and communications for all elevator(s) shown on the architectural plans..
  9. Provide emergency generator, transfer switch and emergency panel to serve life safety loads in the building including: FA, TEL, lighting and elevator.

## 1.2 SUBMITTALS

- A. The following information shall be submitted to the architect in a timely manner allowing for review and revision as may be necessary before work is begun:
  1. Name, address and telephone number of the licensed electrical engineer.
  2. Detailed engineering documents, drawings and specifications, as prepared and stamped by the engineer of record.

## 221 Congress St

- B. Manufacturer's product data and installation instructions for each material and product proposed for use in areas exposed to view.

### 1.3 QUALITY ASSURANCE

- A. Comply with governing codes, regulations, standards and guidelines, including but not necessarily limited to the following:
  - 1. National Electrical Code (NEC)
  - 2. National Electrical Safety Code (NESC)
  - 3. International Building Code (IBC)
  - 4. National Fire Protection Association (NFPA)
  - 5. Occupational Safety and Health Act
  - 6. Americans with Disabilities Act
- B. All materials and equipment shall be listed by Underwriters Laboratories (UL), and approved for intended service.
- C. All materials shall be new and free from defects at the time of installation. Install materials and equipment in conformance with manufacturer's written requirements.

## PART 2 - PRODUCTS

### 2.01 RACEWAYS AND FITTINGS

- A. Rigid steel conduit, electric metallic tubing, (elbows, couplings and fittings) shall be hot dipped galvanized steel and shall conform to the latest ASA Standards.
- B. Flexible metal conduit shall be galvanized steel (NEC-350). Liquid tight flexible conduit shall be UL listed (NEC-351).
- C. Fittings for rigid steel conduit shall be cast or malleable iron bodies, cadmium or zinc plated, with taper threads and tapped holes for screw attached cover plates for installation in moist or wet locations, and shall have gaskets of an approved material.
- D. Conduit boxes, outlet, switch, junction, pull boxes, extension rings, adapters, and cover plates shall be sherardized galvanized or cadmium plated. Boxes for concealed work shall be stamped steel with stamped steel accessories. Boxes for exposed work shall be cast or malleable iron. UL listed PVC boxes and fittings may be used for concealed construction where permitted by the NEC.
- E. Rigid non-metallic conduit shall be used underground only and comply with NEC-347. Approved PVC solvent shall be used for welding PVC conduit and fittings. Furnish listed PVC expansion joints for PVC conduit runs per manufacturer's recommendations.

### 2.02 CONDUCTORS

- A. Conductors shall be copper Type MC where allowed by NEC or EMT and wire. ROMEX WILL BE ALLOWED IF PRIOR APPROVAL FROM AHJ IS OBTAINED.
- B. Grounding conductors shall be copper with green insulation.
- C. Copper conductors #2 and larger may be aluminum providing the following items are adhered to:

## 221 Congress St

1. The ampere capacity, voltage drop and conduit fill is in accordance with the NEC and equal to copper conductors specified herein.
2. Prior to making any connection the aluminum wire is to be brushed and an oxide inhibitor applied.
3. Lugs and connectors are to be rated cu/al compression type.
4. Termination of aluminum conductors at heat producing equipment such as motors or heaters is not acceptable.

### 2.03 PANELBOARDS AND BOXES

- A. Panels, cabinets, and boxes shall be code gauge steel. Boxes shall comply with NEC requirements. Concealed outlet boxes shall be of code gauge galvanized or sherardized metal not less than #14 gauge. Junction boxes shall be of code gauge steel, cast, or PVC.
- B. Panelboards shall be furnished with active breakers, spare breakers and spaces as required. Panels shall have an equipment ground bus and when indicated shall also have an insulated and isolated ground bus for computer circuits. Panels shall have main breaker or main lugs as required by the NEC. Panels shall be provided with 20% future growth capacity in mains and quantity of branch breakers.
  1. Each subpanel shall have a hinged door with lock and typed directory.
  2. Terminal connectors shall be UL listed al/cu type.
  3. Flush and surface mounted panels shall have factory furnished trim. Panel boxes shall be galvanized steel, code gauge, primed and painted manufacturer's standard finish. Flush panels shall be furnished with 6-3/4" @ empty conduits stubbed up into hung ceiling space and capped for future use.
  4. Panel breakers shall be UL listed quick make, quick break, thermal magnetic type. Breakers shall have interrupting ratings capable of interrupting the available short circuit fault current. HVAC refrigeration loads require HACR rated breakers. Connect panel breakers to insure proper load balance between phases.
- B. Fused and unfused switches shall be General Duty or as required. Fuses shall be furnished for fused disconnect switches. Fuses shall be dual-element of required or specified voltage and current rating. Furnish Owner with one set of spare fuses for each type installed.

### 2.04 GROUNDING SYSTEMS

- A. Grounding conductors shall be copper and sized per N.E.C. Article 250 - Tables 250-66 and 250-122. Green grounding conductors shall be run in all raceways and cables shall include a green grounding conductor.
- B. Panelboards shall be furnished with equipment ground bus. Panelboards supplying computer receptacles shall also be furnished with insulated/isolated ground bus. Install an isolated grounding conductor back to main ground connection point.

## 221 Congress St

### 2.05 ELECTRIC SERVICE

- A. Contractor shall provide complete installation including meter enclosure and coordination with Central Maine Power. Furnish and install the main service ground in compliance with Article 250 in the NEC.
- C. Individual feeders shall be installed from the main panel to the respective panels and/or equipment.

### 2.07 LIGHTING FIXTURES

- A. LED or fluorescent fixtures shall have super T8 or T5 electronic ballasts and associated lamps. All fixtures shall qualify for Efficiency Maine incentives electrical contractor responsible for filling out and submitting paperwork for the Owner to Efficiency Maine.
- C. All lighting fixtures shall be selected and approved by Architect.
- D. IES Lighting handbook guidelines shall be used to determine light levels in all areas. Light level calculations shall be provided for review by the Engineer.

### 2.08 TELEPHONE SYSTEM

- A. Contractor is responsible for boxes, jacks, cables, conduits, testing, labeling, terminations. Quantity and locations of tel shall be coordinated with the Architect and Owner.

### 2.09 FIRE ALARM SYSTEM

- A. Notifier, Gamewell, Simplex or equal. All notification devices shall be ceiling mounted and white color.

### 2.10 COMPUTER/DATA SYSTEM

- A. Contractor is responsible for boxes, jacks, cables, conduits, testing, labeling, terminations. Quantity and locations of data shall be coordinated with the Architect and Owner.

### 2.11 SECURITY SYSTEM

- A. By others.

## PART 3 EXECUTION

### 3.01 INSTALLATION OF PANELBOARDS

- A. Set panelboards and boxes plumb with the building lines. Mount panelboards so that the top of the panel is not higher than 6'-6" AFF.
- B. Panelboards shall have engraved plastic nameplates fastened with screws.

### 3.02 INSTALLATION OF GROUNDING SYSTEMS

**221 Congress St**

- A. Grounding shall be in strict compliance with the National Electrical Code, Article 250 and 517.
- B. Metallic conduit shall be grounded in accordance with NEC requirements; and equipment grounding conductors shall also be furnished and installed in all branch circuit and feeder raceways. Cables shall include a separate, insulated grounding conductor.
- C. Equipment grounding conductors shall be insulated copper with green jacket as covered by the NEC.
- D. The green grounding screw on all wiring devices shall be used for grounding connections.

**END OF OUTLINE SPECIFICATION**

SECTION 312000 - EARTH MOVING

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. This Section includes the following:
  - 1. Preparing subgrades for slabs-on-grade walks pavements and exterior plants.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage course for slabs-on-grade.
  - 4. Subbase and base course for concrete walks.
  - 5. Subbase and base course for asphalt paving.
  - 6. Subsurface drainage backfill for walls and trenches.
  - 7. Decorative gravel.
  - 8. Excavating and backfilling for utility trenches within the building excavation limits.
  - 9. Excavating and backfilling for site utility trenches.
  - 10. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
  - 11. Provision, transportation and placement of all required fill and backfill materials.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  2. Bulk Excavation: Excavation more than 10 feet in width.
  3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 2 cu. yd. for bulk excavation or 1 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf; measured according to SAE J-1179.
  2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Aggregate layer placed between the subgrade and base course.
- K. Subgrade: Uppermost surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
1. Each type of plastic warning tape.
  2. Geotextile fabrics.
- B. Samples:
1. 12-by-12-inch Sample of geotextile.
  2. Decorative gravel.



- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.
- D. Blasting Plan: For record purposes; approved by authorities having jurisdiction.
- E. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

### 1.5 QUALITY ASSURANCE

- A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
  - 1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
  - 2. Seismographic monitoring during blasting operations.
- B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
  - 1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
  - 2. Seismographic monitoring during blasting operations.
- C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- D. Earthwork Observation and Testing:
  - 1. The owner and/or owner's agent will retain a qualified Geotechnical Engineer and/or testing agency to perform onsite observation and testing during work under this and related sections and as indicated in the "Schedule of Special Inspections." The services of the geotechnical engineer/testing agency may include, but not be limited to, the following:
    - a. Observation during excavation, subgrade preparation and backfill for footings, slabs-on-grade, and subsurface drainage construction, etc.
    - b. Determination of requirements for additional excavation to remove unsuitable materials.
    - c. Observation and testing during placement and compaction of fill and backfill.

- d. Laboratory testing and analysis of fill materials specified.
  - e. Review of submittals.
- 2. During the course of construction the Geotechnical Engineer/testing agency shall advise the owner's agent, in writing, with a copy to the Architect and Contractor, if at any time, in his opinion, the work is not in substantial conformity with the plans and specifications. The Geotechnical Engineer's and/or testing agency's presence does not include supervision of direction of the actual work by the Contractor, his employees, subcontractors or agents. Neither the presence of the geotechnical engineer and/or testing agency, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.
  - 3. Testing equipment will be provided by and testing performed by the Geotechnical Engineer and/or testing agency, except as otherwise provided by contract. Upon request by the owner's agent, the Contractor shall provide such auxiliary personnel and services as needed to accomplish testing work and to repair damage caused thereby to permanent work.
  - 4. References herein to observations, testing and determinations by the "Engineer" include services to be provided by the Geotechnical Engineer and/or testing agency when appropriate and when so authorized by the engineer or owner.
- E. Pre-excavation Conference: Conduct conference at Project site.
- 1. Before commencing earthwork, meet with representatives of the governing authorities, owner, architect, engineer, consultants, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least three working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

## 1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
- 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Existing Utilities:
- 1. Notify utility locator service for area where project is located before site clearing or excavating. Contact Dig Safe not less than 3 business days before starting the work. Dig Safe requirements are in addition to local and/or State DOT street opening permit requirements
  - 2. Hire private utility markout service for areas not marked by utility companies. See the "General Conditions" of the construction contract.
  - 3. Before starting excavation, establish location and extent of any underground utilities occurring in work area. Make arrangements with appropriate utility company for removal

- and relocation of lines which are in the way of excavation. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
4. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for direction. Cooperate with owner, owner's agent, and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
  5. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped. The location of such utilities shall be noted on record drawings and reported in writing to owner's agent. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff services if lines are active.
  6. Do not interrupt existing utilities serving facilities occupied and used by owner or others, during occupied hours, except when permitted in writing by owner's agency and then only after arranging to provide acceptable temporary utility services. Provide minimum of 48 hour notice to owner's agent and receive written notice to proceed before interrupting any utility. Do not proceed with utility interruptions without owner's written permission.
  7. When in the course of the work it is necessary to connect a utility to a main in a public way, all the requirements of both the authorities governing the utility and those governing the public way shall be met. Pavement shall be temporarily and permanently replaced as directed by these authorities at no additional cost to the owner.
- C. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS - GENERAL

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
  1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
  2. Unsuitable Materials also include material containing excessive plastic clay, vegetation, organic matter, debris, pavement, stones or boulders over 6 inches in greatest dimension, and frozen material. Material which, in the opinion of the Geotechnical Engineer, will not provide a suitable foundation or subgrade.
- D. On-Site Material: Any suitable material from on-site excavation.

- E. Common Borrow: Inorganic mineral soil suitable for embankment construction free from frozen material, perishable rubble, peat and other unsuitable material.
- F. Backfill and Fill: Satisfactory soil materials.
- G. Unless indicated otherwise, materials shall conform to the "Standard Specification for Highways and Bridges" revision of December 2014, Maine Department of Transportation (abbreviated as MDOT "Standard Specification").
- H. General Fill: Clean, sound mixture of material free of debris, waste, frozen materials and organics with 5 inch maximum size aggregate and not more than 12 percent passing the No. 200 sieve.

2.2 SOIL MATERIALS FOR ROADWAYS AND PARKING LOTS

- A. Aggregate Subbase Material: Shall meet the requirements of Maine Department of Transportation Standard Specifications Section 703.06(b), Type D.
- B. Aggregate Base Materials: Shall meet the requirements of MDOT Standard Specifications Section 703.06(a), Type A, Section 703.06(a), Type B as indicated.

2.3 SOIL MATERIALS FOR STRUCTURES

- A. Foundation Backfill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand which are free from vegetable matter, lumps, or balls of clay, and other deleterious substances with no particles of rock that will not pass the 3-in. square mesh sieve. The gradation of the portion which will pass a 3-inch sieve shall meet the grading requirements of the following table:

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
3 inch	100
1/4 inch	25-100
No. 40	0-50
No. 200	0-6

- B. Structural Fill (under concrete slabs): Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand which are free from vegetable matter, lumps, or balls of clay, and other deleterious substances with no particles of rock that will not pass the 3-in. square mesh sieve. The gradation of the portion which will pass a 3-inch sieve shall meet the grading requirements of the following table:

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
3 inch	100
1/2 inch	35-80
1/4 inch	25-65
No. 40	0-30

No. 200

0-7

- A. 3/4 Inch Crushed Stone (under footings): Crushed stone shall be a quarry product 3/4 inch or washed gravel stone obtained from offsite sources for use as detailed on the drawings. Crushed stone shall consist of durable crushed rock or gravel stone essentially free of silt, clay, loam or other deleterious materials and shall conform to the following gradation requirements for the nominal size indicated.

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
1 inch	100
3/4 inch	90-100
1/2 inch	20-55
3/8 inch	0-15
No. 4	0-5

2.4 PIPE BEDDING MATERIALS

- A. Sand: ASTM C 33; fine aggregate.
- B. 3/4 Inch Crushed Stone: Crushed stone shall be a quarry product 3/4 inch or washed gravel stone obtained from offsite sources for use as detailed on the drawings. Crushed stone shall consist of durable crushed rock or gravel stone essentially free of silt, clay, loam or other deleterious materials and shall conform to the following gradation requirements for the nominal size indicated.

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
1 inch	100
3/4 inch	90-100
1/2 inch	20-55
3/8 inch	0-15
No. 4	0-5

2.5 GEOTEXTILES

- A. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  1. Basis-of-Design Product: Mirafi 600X by Mirafi Inc., P.O. Box 240697, Charlotte, North Carolina 28224.
  2. Survivability: Class 2; AASHTO M 288.
  3. Grab Tensile Strength: 247 lbf; ASTM D 4632.
  4. Sewn Seam Strength: 222 lbf; ASTM D 4632.
  5. Tear Strength: 90 lbf; ASTM D 4533.
  6. Puncture Strength: 90 lbf; ASTM D 4833.
  7. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.

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8. Permittivity: 0.02 per second, minimum; ASTM D 4491.
9. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

### 2.6 DECORATIVE GRAVEL

- A. To be determined.

### 2.7 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
  1. Red: Electric.
  2. Yellow: Gas, oil, steam, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems.
  5. Green: Sewer systems.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Prepare subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface.
- C. Protect and maintain erosion and sedimentation controls, which are specified on the drawings.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.
- E. Paved surfaces: Do not operate equipment on paved surfaces that will damage surface.
- F. Preparation of Building Area for Foundations:
  1. The Contractor's bid is to include the costs to excavate and legally dispose of from the site all materials within the building footprint to the subgrade elevations indicated on the drawings, including stripping of topsoil. The Contractor's bid is also to include all excavation of the area of proposed footings plus 2 feet horizontally (minimum) beyond the area of all footings as well as excavation of necessary transitional slopes per OSHA requirements, and backfill with compacted granular fill. The Contractor's bid is to include the removal of all previous construction including foundations, walls, slabs and

abandoned utilities from within the limits of the proposed building. Additionally the Contractor's bid is to include the costs to furnish and place compacted granular fill and base materials to the slab subgrade elevations indicated on the drawings.

2. Excavation of Unsuitable Material within the Influence of the Building Foundations: Additional excavation to remove existing fill or other unsuitable material from within the areas of influence of the foundations and below slabs-on-grade shall be conducted when so directed by the Geotechnical Engineer. The horizontal limits of excavation below footing level shall be one foot beyond the outside perimeter of the footing plus an additional one foot for every foot of depth below the footing, unless otherwise directed by the engineer.

### 3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. The Contractor shall grade and ditch the site as necessary to direct surface runoff away from open excavations.
  2. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to keep all excavations and work sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction product or procedures nor cause excessive disturbance of underlying natural ground or footing and slab subgrades. Contractor shall similarly control water entering the excavation as a result of construction operations, such as washing of concrete equipment and tools and the like.
  3. Water from trenches and excavations shall be disposed of in such a manner as will not cause injury to public health, nor damage to public or private property, existing work, or work in progress, nor to the surface of roads, walks and streets, nor cause any undue interference with the use of the same by the public. The Contractor shall comply with all applicable environmental protection and/or sediment/erosion control regulations.
  4. Under no circumstances place concrete or fill, or lay piping or install appurtenances in excavations containing free water. Keep utility trenches free from water until pipe joint material has hardened.

### 3.3 SHEETING, SHORING AND BRACING

- A. Provide sheeting, shoring and/or bracing at excavations as required to assure safety against collapse of earth or rock at sides of excavations; as required for support of adjacent structures, streets or utilities; or as required to comply with federal, state or local regulations, codes or ordinances.
- B. Provide materials for sheeting, shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down sheeting, shoring and bracing as excavation progresses.

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- C. All sheeting and bracing not ordered left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities or property whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand and rammed with tools especially adapted to that purpose or otherwise compacted as directed to achieve the required density.
- D. Wood sheeting shall not be completely withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than one foot above the top of pipe.

### 3.4 EXPLOSIVES

- A. Not applicable.

### 3.5 EXCAVATION, GENERAL

- A. Stability of Excavations:
  - 1. Slope sides of excavations to comply with OSHA regulations and local codes. Shore and brace where sloping is not possible because of space restrictions or stability to material excavated.
  - 2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
- B. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include soil materials, and obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials, replace with satisfactory soil materials.

### 3.6 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Spread Footing Subgrades:



1. Spread footing foundations shall bear on natural inorganic soil or compacted crushed stone overlying natural inorganic soils. The compacted crushed stone shall extend at least one foot horizontally beyond the limits of the footing.
2. Footing subgrades shall be prepared by excavating all existing material to the specified bottom of the footing elevation, 5 feet below existing grades, or as indicated on the Contract Documents, whichever is lower. Allow the geotechnical engineer to view the excavated subgrade at this level. The geotechnical engineer shall determine whether authorized additional excavation is required to remove unsuitable material. Remove and replace such unsuitable material in accordance with paragraph 3.05 B.2 of this section or as otherwise directed by the engineer.
3. The Contractor shall take every precaution to minimize the disturbance of excavated subgrades in the natural soils. Such precautions shall include, but not be limited to, using excavation buckets without teeth and/or accomplishing excavation to final subgrade with hand tools. All materials disturbed during excavation shall be removed to undisturbed natural soils or re-compacted as directed by the engineer.
4. Refill excavation to the specified bottom of the footing elevation with crushed stone placed and compacted in accordance with the requirements of this Section.
5. Proof compact the final footing subgrade with at least two passes of a vibratory plate compactor immediately prior to placing forms and reinforcing.

C. Subgrade for Slabs-on-Grade:

1. Slabs-on-grade shall be supported on subbase/base courses as indicated on the drawings.
2. Remove and replace excessively wet, disturbed or unstable material and proof compact the subgrade for the slab subbase/base course with at least six passes of a vibratory plate or vibratory roller compactor immediately prior to placement of slab base course material unless otherwise directed.
3. The final surface of the subgrade for the moisture retarder membrane and/or slabs-on-grade shall be proof rolled with at least four passes of an approved vibratory plate or vibratory drum compactor immediately prior to placing the membrane, reinforcing or concrete (as may be applicable).

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
- B. Saw cut pavement prior to excavation to provide a clean, uniform edge. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement required to do the work.
- C. Use shoring and bracing where sides of excavation will not stand without undermining pavement.

3.8 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
  1. Clearance: 9 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
  3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

### 3.9 SUBGRADE INSPECTION

- A. Notify Architect, Geotechnical Engineer and Owner's agent when excavations have reached required subgrade.
- B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed and in accordance with Article "Excavation for Structures" of this section.
- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized Additional Excavation: In the case that unsuitable materials, as determined by the engineer, are encountered at the specified subgrade elevation, the engineer may direct the removal of the unsuitable material and refill with granular fill placed and compacted in accordance with the requirements of this Section. This work will be paid for according to Contract provisions for changes in the Work.

- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

- A. Unauthorized Excavation: Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the engineer or owner's agent. Unauthorized excavation, as well as remedial work specified by the engineer, shall be at the Contractor's expense.
  - 1. In areas below structures, pavements and walks, backfill unauthorized excavation with granular fill placed and compacted in accordance with this Section, unless otherwise directed by the engineer.
  - 2. Elsewhere, backfill and compact unauthorized excavations with general fill, compacted to the requirements of this Section.
  - 3. Where the excavation of otherwise suitable materials is required due to these materials being rendered unsuitable due to disturbance, construction activity, freezing or lack of protection from the elements, the Contractor shall excavate these materials and provide remedial work as specified above at no additional cost to the owner.
- B. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

- A. Backfilling Prior to Acceptance of Work Installed:
  - 1. Do not allow or cause the work performed or installed to be covered up or enclosed by work of this Section prior to all required inspections, tests and acceptances.
  - 2. Should any of the work be so enclosed or covered up before it has been accepted, uncover all such work at no additional cost to the owner.
  - 3. After the work has been completed, tested, inspected and accepted, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the owner.

- B. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring and bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- C. Place backfill on subgrades free of mud, frost, snow, or ice.
- D. Unless otherwise specified or indicated on the drawings, the products specified in Part 2 of this Section shall be employed in the various fill and backfill applications indicated in that part. Place and compact fill material in layers to required elevations as follows:
  - 1. Under steps and ramps, use granular fill material.
  - 2. Under building slabs-on-grade, use granular fill, crushed stone and sand-gravel material. See Contract Documents for additional information.
  - 3. Under footings and foundations, use granular fill.
  - 4. Against the interior face of foundation walls, use granular fill material. Use granular fill material to 3'-0" beyond the outside face of foundation walls. Use general fill beyond the 3 feet of granular fill.
  - 5. Against the interior face (retained soil side) of site retaining walls use granular fill material. Use granular fill material to 3'-0" beyond the inside (retained soil side) of site retaining walls. Use general fill beyond the 3 feet of granular fill.
  - 6. Under utilities, use either bedding material or crushed stone (see drawings).
  - 7. Under equipment pads, use crushed stone.
  - 8. Under grass and planted areas, use general fill
  - 9. Under walks and pavements, use base and subbase material
- E. All vegetation, peat, organic topsoil or subsoil, trash, debris, roots, stumps, and any compressible or otherwise deleterious materials shall be stripped from the existing ground surface and removed from excavations prior to placement of fill or backfill.
- F. All fill and backfill materials shall be placed in horizontal layers. Each layer shall be spread evenly and thoroughly mixed during spreading to ensure uniformity of material in each layer. Layer thickness shall not exceed that specified elsewhere in this Section.
- G. Where horizontal fill layers meet a natural or excavated slope, the layer shall be keyed into the slope by cutting a bench. The surface of benches shall be compacted to the same requirements as apply to the area being filled.
- H. In no instance place fill over materials that were permitted to freeze prior to compaction or over ice or snow. Removal of such materials will be required as directed by the engineer. In no case will frozen material be allowed for use in fill or backfill.
- I. No fill shall be placed or compacted during unfavorable weather conditions. When work is interrupted by heavy rains or snow, fill operations shall not be resumed until the moisture content and density of previously placed fill are as specified hereinafter.

3.13 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Backfill under all existing utility pipes crossed during construction operations with 3/4-inch crushed stone. Crushed stone backfill shall extend continuously from the bedding of new utility pipes to the utility pipe crossed, including a 6-inch thick envelope of crushed stone all around the existing utility pipes. Crushed stone backfill shall stand at its own angle of repose. No "haunching" or "forming" with common fill will be allowed.
- E. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- F. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Electrical and Telecommunications Conduit:
  - 1. Electrical Conduits: Bury beneath finish grade a minimum of 30 inches to top of conduit, or as required by the National Electrical Code or local utility company, whichever is deeper. Surround conduits by a minimum of 6 inches of sand or bedding material.
  - 2. Telephone and Communication Conduits: Bury beneath finish grade a minimum of 30 inches to top of conduit, or as required by the local utility company, whichever is deeper. Surround conduits by a minimum of 6 inches of sand or bedding material.
- H. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- I. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- J. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- K. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- L. Coordinate backfilling with utilities testing.

3.14 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.15 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
- B. Moisture Control:
  - 1. Water shall be added to fill material which does not contain sufficient moisture to be compacted to the specified densities. Fill and backfill material containing excess moisture shall be required to dry prior to or during compaction to a moisture content not greater than two percentage points above optimum except that material which displays pronounced elasticity or deformation underfoot or under load shall be required to dry to optimum moisture content before it is placed and compacted, if that is required to achieve specified compaction. At the Contractor's option, material which is too wet may be removed and replaced with satisfactory material at no additional cost to the owner.
  - 2. The Contractor is alerted to the potential silty nature of the onsite soil which renders them sensitive to moisture. Onsite silty soils are difficult to handle and compact and are easily disturbed when wet. The Contractor shall plan and conduct his excavation and filling operations considering the nature of the onsite materials.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

- C. Allow the geotechnical engineer sufficient time to make necessary observations and tests. The degree of compaction shall be based on a maximum dry density as determined by ASTM Standard D1557. All fill and backfill placed in various areas shall be compacted in individual layers to minimum dry densities as follows:
1. Under Structures, within Building Foundation Backfill Limits, Equipment Pads, Building Slabs, Steps and Pavements: 95 percent.
  2. Beside site retaining walls or tank walls: 95 percent
  3. Top 2 feet under pavement: 95 percent
  4. Below top 2 feet under pavement: 92 percent
  5. Trenches through paved areas, top 2 feet:: 95 percent
  6. Trenches through paved areas, below top 2 feet: 92 percent
  7. Trenches through unpaved areas: 92 percent
  8. Embankments: 92 percent
  9. Pipe Bedding: 92 percent
  10. Under pipes through structural fills: 92 percent
  11. Underdrain filter sand: 92 percent
  12. Sand bedding for conduit: 95 percent
  13. Grass and mulch areas: 90 percent
  14. Uniformly graded crushed stone materials which are not suited to field density testing shall be compacted in accordance with the minimum compactive effort indicated in paragraph 3.10 L of this Section.
- D. The term "under," as applied to building, structures and paved areas, shall be construed to include all materials immediately below the plan area of the building, as well as those materials within a line sloping at one vertical to one horizontal drawn downward and outward from the exterior of building foundation, structure foundation or paved area.
- E. Compaction shall be by mechanical means designed specifically for compaction and approved by the engineer. The engineer reserves the right to disapprove any device or inadequate capacity or of type unsuited to the character of the material being compacted. In areas which are too restricted to permit the use of mechanical compactors, fill may be placed in 3 inch layers and compacted by hand rammer or pneumatic tools.
- F. In addition to the stated degree of compaction, all fill and backfill shall receive at least the compactive effort given in the following table. Lift thickness shall not exceed that shown for the compaction method selected, except that the first lift of fill or backfill placed over natural ground in wet conditions may be as much as 12 inches thick. Application of the minimum compactive effort does not relieve the contractor from his requirement to achieve the specified degree of compaction.

Compaction Method	Maximum Stone Size	Maximum Loose Lift Thickness	Maximum Loose Lift Thickness	Minimum Number of Passes	Minimum Number of Passes
		Below Structures and Pavement	Less Critical Areas	Below Structures and Pavement	Less Critical Areas
Hand-operated vibratory	3"	6"	8"	6	4

plate or light roller in confined areas					
Hand-operated vibratory drum rollers weighting at least 1,000 lbs	6"	8"	10"	6	4
Hand-operated vibratory drum rollers weighting at least 3,000 lbs	6"	8"	14"	6	4
Hand-operated vibratory drum rollers weighting at least 5,000 lbs	6"	8"	18"	6	4
Hand-operated vibratory drum rollers weighting at least 8,000 lbs	6"	8"	24"	6	4

G. Where the engineer determines that fill or backfill does not conform to the compacted density specified, or did not receive the minimum compactive effort specified, such fill shall be removed and replaced with conforming materials at the Contractor's own cost.

H. Backfilling of Walls:

1. Do not backfill against walls until completion of slabs-on-grade, structural framing and suspended slabs which provide lateral support to these walls. In placing backfill, take special care to prevent any wedge action, eccentric loading or overloading by equipment used in backfilling and compaction. See Contract Documents for additional requirements.
2. Do not use equipment weighing more than 5,000 lbs. within 10 feet of all walls. Equipment weighing more than 5,000 lbs. shall not be used adjacent to walls, except as expressly approved by the engineer.
3. Backfill shall be placed concurrently on all sides of shafts, tunnel, and freestanding walls, each lift being compacted on all sides before successive lifts are placed. See Contract Documents for additional requirements.
4. Prevent damage to wall waterproofing or dampproofing when backfilling.

3.17 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1/2 inch.



3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
- D. Maintenance:
  1. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
  2. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

### 3.18 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
  1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
  1. Compact each filter material layer [**to 85 percent of maximum dry unit weight according to ASTM D 698**] [**with a minimum of two passes of a plate-type vibratory compactor**].
  2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.
- D. Drainage Backfill for Site Retaining Walls: Place and compact granular fill material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
  1. Compact each granular fill material layer to specified compaction of soil backfills and fills requirements.
  2. Place and compact impervious fill over drainage backfill in 6-inch thick compacted layers to final subgrade.

3.19 SUBBASE AND BASE COURSES

- A. On prepared subgrade, place subbase and base course under pavements and walks as follows:
  - 1. Place base course material over subbase course under hot-mix asphalt pavement.
  - 2. Shape subbase and base course to required crown elevations and cross-slope grades.
  - 3. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
  - 4. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 5. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.20 DRAINAGE COURSE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  - 2. Place drainage course 6 inches or less in compacted thickness in a single layer.
  - 3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.21 FIELD QUALITY CONTROL

- A. **Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:**
  - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
  - 2. Determine that fill material and maximum lift thickness comply with requirements.
  - 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, each soil stratum will be verified by a Geotechnical Engineer to confirm subgrade preparation and ability to support design bearing capacities.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.

1. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
  2. When field in-place density tests are performed using nuclear methods, make calibration checks for both density and moisture gages at the beginning of work, on each different type of material encountered and at intervals as directed by the engineer.
  3. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
  4. Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests along a wall face.
  5. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
  6. Pavement areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

### 3.22 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.23 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.
- B. If hazardous waste or special waste as defined by the U.S. Environmental Protection Agency or State Department of Environmental Protection is encountered during excavation, the Contractor shall avoid disturbance of that material, and shall notify the Engineer

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immediately. The State Bureau of Oil and Hazardous Waste Control shall be notified and consulted prior to disturbance of the waste or contaminated soil. Removal and disposal of contaminated materials is not included in the Contract, and will be paid for by appropriate change order.

END OF SECTION 312000

SECTION 321216 - ASPHALT PAVING

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. Cold milling of existing hot-mix asphalt pavement.
  - 2. Hot-mix asphalt patching.
  - 3. Hot-mix asphalt paving.
  - 4. Asphalt surface treatments.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
  - 1. Job Mix Designs: Contractor shall submit a mix design using either the “Marshall Stability” or “Superpave” Mix Design Submittal Forms, included in this specification, for each pavement course proposed for construction for the Owner’s review and approval 45 days prior to schedule production and placement of the mix.
  - 2. “Marshall Stability” design mix submittals shall include type/name of mix, gradation analysis, grade of asphalt cement, Marshall Stability in pounds flow, effective asphalt content in percent (%), and corresponding copies of the Maine Department of Transportation (MDOT) material specifications.
  - 3. “Superpave” design mix submittals may be submitted in lieu of a “Marshall Stability” design mix, meeting the specifications of the Maine Department of Transportation.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Material Certificates: Contractor shall submit certificates stating that asphalt mix to be supplied complies with the specifications of the Maine Department of Transportation, as well as copies the regulatory specifications corresponding to the asphalt mix formula and material. The certificates shall be signed by the asphalt mix producer and the Contractor.

- D. Material Test Reports: Provide two copies of each test.
  - 1. Aggregate Material: Submit laboratory test reports that aggregates used in the bituminous mix conform to Section 703 of the MDOT Specifications.
  - 2. Asphalt Cement: Submit laboratory test reports that bituminous material used in the bituminous mix conforms to Section 702 of the MDOT Specifications.
  - 3. In-Place, Compacted Bituminous Concrete Mix: Submit laboratory test reports of samples cut from the in-place, compacted pavement indicating the percentage of theoretical maximum density (TMD), based on laboratory specimens of the mix combined in the proportions of the job mix formula.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be registered with and approved by authorities having jurisdiction and the MDOT.
- B. Qualifications of Bituminous Concrete Producer: Use only materials which are furnished by a bulk bituminous concrete producer regularly engaged in production of hot-mix, hot-laid bituminous concrete.
- C. Paving Contractor: Paving contractor shall be listed in the MDOT prequalified contractor list for paving projects and shall be valid at time of paving operations.
- D. Testing Agency Qualifications: Use only recognized commercial testing laboratories with not less than 5 years experience in conducting tests and evaluations of bituminous concrete materials and design.
- E. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
    - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
    - b. Review condition of subgrade and preparatory work.
    - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
    - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Tack Coat and Prime Coat: Minimum ambient temperature in the shade is 40 degree F and rising, immediately prior to application;
  - 2. Asphalt Base Course: Minimum surface temperature of 40 degree F and rising at time of placement;
  - 3. Asphalt Binder (Intermediate) Course: Minimum surface temperature of 40 degree F and rising at the time of placement; and,
  - 4. Asphalt Surface Course: Minimum surface temperature is above 50 degree F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Aggregates: Conform to Section 703 of MDOT Specifications.

2.2 ASPHALT MATERIALS

- A. Asphalt Cement: Conform to Section 702 of MDOT Specifications.
- B. Prime Coat - emulsified asphalt applications shall meet the requirements of AASHTO M140, and the MDOT specifications.
- C. Tack Coat - emulsified asphalt applications shall meet the requirements of AASHTO M140 and meet MDOT specifications.
- D. Water: Potable.
- E. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.3 MIXES

- A. Hot Mix Asphalt – Per MDOT approved mix.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.
- D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
  - 1. Mill to a depth as indicated on the drawings.
  - 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
  - 3. Control rate of milling to prevent tearing of existing asphalt course.
  - 4. The Contractor shall coordinate the adjustment of manholes, meter boxes, drainage inlets, and valve boxes with the milling operation.
  - 5. Repair or replace curbs, manholes, and other construction damaged during cold milling.
  - 6. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
  - 7. Transport milled hot-mix asphalt to asphalt recycling facility.
  - 8. Keep milled pavement surface free of loose material and dust.
- B. All milled material shall become the property of the Contractor and shall be disposed of off-site or used in conformance with Section 312000, Earthwork, or for utilization as Reclaimed Asphalt Pavement, in conformance with the specification provided above, as approved by the Owner.

3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into



adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
  - 1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
  - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
  - 3. For patching where base or intermediate pavement is present, provide horizontal tack coat.
- D. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

### 3.4 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
  - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

### 3.5 SURFACE PREPARATION

- A. Proofroll crushed aggregate base in conformance with Section 312000 Earthwork, immediately prior to paving.
- B. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.

- D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
  - 3. Adequate traffic control shall be provided to prohibit traffic from traversing applied area.
  - 4. Any foreign matter on tack coat is to be removed and area re-tacked before applying pavement.

### 3.6 HOT-MIX ASPHALT PLACING

- A. Plant Mix Hot Bituminous Pavement: Produce and place in conformance with Section 401 of MDOT Specifications.
- B. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  - 2. Spread mix at minimum temperature of 250 deg F and maximum temperature of 325 deg F.
  - 3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  - 4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- C. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- D. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.7 PERMANENT TRENCH PAVEMENT REPAIR

- A. Saw edges of existing pavement to provide a vertical bonding face.
- B. Remove temporary paving and sawn out existing paving.
- C. Reset manhole frames and covers.
- D. Apply a tack coat to the sawn edges.
- E. Apply hot mix asphalt as directed by Contract Documents.

- F. Roller compact both courses, compacting the final wear course to meet existing pavement surfaces exactly

### 3.8 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  - 4. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
  - 5. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.9 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
  - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  - 1. Average Density: 95 percent of reference maximum theoretical density according to ASTM D 2041 for binder (intermediate) and surface courses.
  - 2. Average Density: 95% ± 2.5% of reference maximum theoretical density according to ASTM D2041 for base courses.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus 1/4 inch.
  - 2. Binder (Intermediate) Course: Plus or minus 1/4 inch.
  - 3. Surface Course: Plus or minus 1/4 inch.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: 1/4 inch.
  - 2. Binder (Intermediate) Course: 1/4 inch.
  - 3. Surface Course: 1/4 inch.
  - 4. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- C. Contractor's duties relating to testing include:
  - 1. Notify Owner 72 hours prior to asphalt paving;
  - 2. Notifying laboratory of conditions requiring testing; and
  - 3. Coordinate with laboratory for field testing.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Testing agency shall be paid by the Owner.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples, at random locations, of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
  - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.

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- b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements at no cost to the Owner.

### 3.12 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow milled materials to accumulate on-site.

END OF SECTION 321216



SECTION 321313 - CONCRETE PAVING

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. This Section includes exterior cement concrete pavement for the following:
  - 1. Driveways.
  - 2. Walkways.
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
  - 1. Cementitious materials.
  - 2. Steel reinforcement and reinforcement accessories.
  - 3. Admixtures.
  - 4. Curing compounds.
  - 5. Bonding agent or epoxy adhesive.
  - 6. Joint fillers.
- D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who 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."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

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

1.7 NOTIFICATION OF RELATED TRADES

- A. Notify all other trades responsible for installing inserts, sleeves, anchors, when ready for such installation, and for final checking immediately before concrete is placed. Cooperate with such trades to obtain proper installation.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
  - 1. Forms shall be constructed to conform to shapes, lines and dimensions shown, plumb and straight and shall be maintained sufficiently rigid to prevent deformation under load. Forms shall be sufficiently tight to prevent the leakage of concrete. Securely brace and shore forms to prevent displacement and to safely support the construction loads.



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- B. 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.

### 2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Plain Steel Wire: ASTM A 82, as drawn.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels 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. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

### 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
  - 1. Portland Cement: ASTM C 150, Type I or II.
    - a. Fly Ash: ASTM C 618, Class C or F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B. Subject to compliance with current USEPA Regulations for volatile organic compounds (VOC) emissions. Curing compound shall not impair bonding of any material to be applied directly to the concrete.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 3575, polyethylene closed-cell expansion joint filler.
  - 1. Product: SonoFlex F by W. R. Meadows (Sonneborn) or approved substitute.
- B. Seal Coat: Seal coat for all exposed concrete walk surfaces shall consist of two coats of Hydrozo Clear 15 as manufactured by Hydrozo Coatings Company, Lincoln, Nebraska or Architect approved equal.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
  - 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
  - 1. Available Products:
    - a. Burke by Edeco; True Etch Surface Retarder.
    - b. ChemMasters; Exposee.
    - c. Conspec Marketing & Manufacturing Co., Inc.; Delay S.
    - d. Euclid Chemical Company (The); Surface Retarder S.
    - e. Kaufman Products, Inc.; Expose.
    - f. Metalcrete Industries; Surfard.

- g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA.
  - h. Scofield, L. M. Company; Lithotex.
  - i. Sika Corporation, Inc.; Rugasol-S.
  - j. Vexcon Chemicals, Inc.; Certi-Vex Envioset.
- F. Joint Sealant: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
- 1. 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 Building Systems; Sonolastic NP1 (VOC 43).
    - b. Sherwin-Williams; Loxon 1K Smooth
    - c. Sika Corporation, Construction Products Division; Sikaflex - 1a.
    - d. Tremco Incorporated; Vulkem 116 or VOC Compliant (VOC 162 & 80).

## 2.6 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
- 1. Compressive Strength (28 Days): 4000 psi.
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
  - 3. Slump Limit: 4 inches, plus or minus 1 inch.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
- 1. Air Content: 7 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- 1. Use water-reducing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

## 2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

#### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

#### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

#### 3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
  2. Provide tie bars at sides of pavement strips where indicated.
  3. **[Butt Joints: Use [bonding agent] [epoxy bonding adhesive] at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.]**
  4. **[Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.]**
  5. **[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.]**
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
  2. Extend joint fillers full width and depth of joint.
  3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
  7. Apply joint sealant material in accordance with manufacturer's instructions.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows[ **to match jointing of existing adjacent concrete pavement**]:
1. **[Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a [1/4-inch] [3/8-inch] radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover 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 developing random contraction cracks.]**

- 3. [Doweled Contraction 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.]**

- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

### 3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- G. Deposit and spread concrete in a continuous operation between limits of construction joints until the placing of the panel or section is completed. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- I. Screed pavement surfaces with a straightedge and strike off.
- J. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

- K. 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 air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  2. Do not use frozen materials or materials containing ice or snow.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
  4. All temporary heat, from insulation, insulated blankets, coverings, or other equipment and materials necessary to protect the concrete work from physical damage caused by frost, freezing action, or low temperature shall be provided prior to start of placing operations. Prior to construction, proposed methods must be approved by the Engineer.
    - a. When the air temperature has fallen to or is expected to fall below 40 deg. F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 deg. F. Temperature shall be maintained in this range for a minimum of 24 hours prior to concrete placement and 72 hours after concrete placement.
- L. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Rfloat surface immediately to uniform granular texture.
1. Non-Slip Broom Finish (NSBrm-Fn): Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
    - a. Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
    - b. Coordinate required final finish with Architect before application.

2. Finishing Landing Slabs:

- a. After striking off and consolidating concrete, smooth the surface by screeding and floating. Use square nose shovels to consolidate along edges and corners. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
- b. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous, smooth finish.
- c. Work edges of exposed slabs with a 1/8 in. radius edging tool, unless otherwise shown.
  - 1) After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing as follows:
  - 2) Provide broom finish by drawing a fine-hair broom across the concrete surface, perpendicular to the line of traffic.
  - 3) Repeat operation if required to provide a fine line texture acceptable to the Architect.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to 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.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  1. **[Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:**
    - a. **Water.**
    - b. **Continuous water-fog spray.**
    - c. **Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.]**
  2. **[Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.**



**Immediately repair any holes or tears during curing period using cover material and waterproof tape.]**

3. **[Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.]**
  - a. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener or with a covering material bonded to concrete such as concrete, waterproofing, damp-proofing, membrane roofing, flooring, painting and other coatings and finish materials, unless otherwise acceptable to Architect.
  - b. No chemical curing, sealing, or parting agents of any kind shall be used without the written approval of the finish floor manufacturer.

### 3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unlevelled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

### 3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 50 cu. yd. 2000 sq. ft. or fraction thereof of each concrete mix placed each day.
  - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/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 mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
  - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

- C. Strength of each concrete mix will be satisfactory if average of any 3 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.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.11 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

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- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313



SECTION 321400 - UNIT PAVING

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. This Section includes the following:
  - 1. Brick pavers set over bituminous bed in aggregate setting beds.
- B. Related Sections include the following:
  - 1. Division 32 Section "Asphalt Paving" for asphalt base under unit pavers.

1.3 SUBMITTALS

- A. Product Data: For the following:
  - 1. Pavers.
  - 2. Bituminous setting materials.
  - 3. Mortar and grout materials.
- B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
- C. Samples for Verification:
  - 1. Full-size units of each type of unit paver indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers 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.
- 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 liquids in tightly closed containers protected from freezing.
- E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Bituminous Setting Bed:
  - 1. Install bituminous setting bed only when ambient temperature is above 40 deg F and when base is dry.
  - 2. Apply asphalt adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.
- C. Weather Limitations for Mortar and Grout:
  - 1. Cold-Weather Requirements: Protect unit paver work against freezing when ambient temperature is 40 deg F and falling. Heat materials to provide mortar and grout temperatures between 40 and 120 deg F. Provide the following protection for completed portions of work for 24 hours after installation when the mean daily air temperature is as indicated: below 40 deg F, cover with weather-resistant membrane; below 25 deg F, cover with insulating blankets; below 20 deg F, provide enclosure and temporary heat to maintain temperature above 32 deg F.
  - 2. Hot-Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
    - a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 BRICK PAVERS

- A. Brick Pavers: Light-traffic paving brick; ASTM C 902. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
  - 1. Product: Subject to compliance with requirements, provide one of the following:
    - a. Standard paver utilized by the City of Portland, Maine.

2.2 ACCESSORIES

- A. Job-Built Mortar Edge Restraints: Provide built-up mortar at paving edges for restraint.

2.3 AGGREGATE SETTING-BED MATERIALS

- A. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.
- B. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.
  - 1. Provide sand of color needed to produce required joint color.

2.4 MORTAR SETTING-BED MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144.
- D. Water: Potable.

2.5 BITUMINOUS SETTING-BED MIX

- A. Mix bituminous setting-bed materials at an asphalt plant in approximate proportion, by weight, of 7 percent asphalt cement to 93 percent fine aggregate, unless otherwise indicated. Heat mixture to 300 deg F.

2.6 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with

optimum performance characteristics. Discard mortars and grout if they have reached their initial set before being used.

- B. Mortar shall consist of 1 part Portland cement, 2 parts sand and sufficient water to obtain the required consistency. Mortar shall be used within 30 minutes after its preparation.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 2. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations. Examine areas where waterproofing system is turned up or flashed against vertical surfaces and horizontal waterproofing. Proceed with installation only after protection is in place.

#### 3.2 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Joint Pattern: Match existing city paver pattern.
- E. Tolerances: Do not exceed 1/32-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.
- F. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

#### 3.3 AGGREGATE SETTING-BED APPLICATIONS

- A. Place leveling course and screed to a thickness of 1 inch, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.
- B. Set pavers tight together, being careful not to disturb leveling base. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.



1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- C. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
  1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
  2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches of the laying face. Cover pavers that have not been compacted, and leveling course on which pavers have not been placed, with nonstaining plastic sheets to protect them from rain.
- D. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
- E. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- F. Repeat joint-filling process 30 days later.

#### 3.4 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point up joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
  1. Remove temporary protective coating from brick pavers as recommended by protective coating manufacturer and as acceptable to unit paver and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

END OF SECTION 321400



SECTION 321613.43 - GRANITE CURBING

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. This Section includes the following:
  - 1. Granite curbing.
  - 2. Granite curbing for tree wells.
- B. Related Sections include the following:
  - 1. Division 31 Section "Earth Moving" for excavation and compacted subgrade.

1.3 DESCRIPTION OF WORK

- A. Provide all materials, equipment, and labor necessary for the placement of granite curbing as shown within the Contract Documents and as specified herein.

1.4 PROJECT CONDITIONS

- A. Work on Public Ways: Comply with all regulations and requirements of local/state agencies having jurisdiction.
- B. Weather Limitations: Comply with requirements in MDOT.

PART 2 - PRODUCTS

2.1 GRANITE CURBING

- A. Provide curbing complying with MDOT Specifications Section 712.04, Vertical Curb, Type 1 and Sloped Granite Curbing, Type 5, complying with MDOT Material Specifications 712.04.
- B. Circular granite curb shall be in reasonable close conformity with the shape and dimensions as shown in the Contract Documents and to the applicable material requirement.
- C. Joint mortar shall be in accordance with MDOT Section 705.02.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install as indicated on Drawings and except as otherwise specified or indicated in compliance with MDOT 609.03.
- B. Set curb with vertical face plumb, curb top parallel to adjacent surface.
- C. The required spacing between sections of curb shall be assured by the use of an approved spacing device to provide an open joint between stones of at least 1/4 inch and no greater than 5/8 inch.
- D. Set curb accurately to line and grade. Fit units as closely together as possible. Do not field cut curbing.
- E. Backfilling: All remaining spaces under the curb shall be filled with approved material and thoroughly hard tamped so the curbing will have a firm uniform bearing on the foundation for the entire length and width. Any remaining excavated areas surrounding the curb shall be filled to the required grade with approved materials. This material shall be placed in layers not exceeding 8 inches in depth, loose measure and thoroughly tamped.
  - 1. When backfill material infiltrates through the joints between the stones, small amounts of joint mortar or other approved material shall be placed in the back portion of the joint to prevent such infiltrating.
  - 2. Reset any curb section disturbed during backfilling or otherwise reset to proper line and grade and properly backfill.

3.2 PROTECTION

- A. Protect the curb and keep in good condition. Clean all exposed surfaces smeared or discolored and restored to a satisfactory condition or the curb stone removed and replaced.

END OF SECTION 321613.43

SECTION 321723 - PAVEMENT MARKINGS

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. Pavement-marking paint.

- B. Related Sections:

- 1. Division 32 Sections for other paving installed as part of crosswalks in asphalt pavement areas.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

- A. Product Data: Provide data on paint products.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

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### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with MDOT Specifications, Section 708.03 (Type F).
  - 1. Color: White.

#### 2.2 EQUIPMENT

- A. Equipment used for the application of pavement striping shall be fully powered and of standard commercial manufacture. Truck mounted equipment may be approved is, in the opinion of the Owner's Representative, the quality of the work of the machine is satisfactory.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. The use of white and yellow materials will require thorough cleaning of equipment so as not to mix the colors. Any mixture of colors will be deemed sufficient reason for rejection of the work be the Owner's Representative, and replacement by the Contractor.

#### 3.2 LAYOUT

- A. The transverse lines, established by the Contractor for control of striping, shall be chalked as a guide and shall be approved by the Owner's Representative before the application of any striping. The length of line shall be measured and marked by the Contractor for the locations listed below. All pavement markings shall be in accordance with the applicable sections of the Manual of Uniform Traffic Control Devices for Streets and Highways, 2001 edition, or most recent.
- B. Stripe pavement graphics shown/detailed on Drawings. Fire lanes, crosswalks, etc. to be marked as shown on Drawings.

#### 3.3 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner's Representative.
- B. Allow paving to age for 48 hours before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint in accordance with MDOT Standard Specifications, Section 627.

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- E. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.4 PROTECTION

- A. Place temporary barriers to keep traffic off paint throughout required drying time.

3.5 CLEANING

- A. If for any reason, paint is spilled or tracked on the pavement, or any markings applied by the Contractor, in the Owner's Representative's judgment, fail to conform to the requirements of this Section, because of a deviation from the desired pattern, the Contractor shall remove such paint by a method that is not injurious to the pavement surface and is acceptable to the Owner's Representative, clean the pavement surface and prepare the surface for a reapplication of markings; and reapply the markings as directed without additional compensation for any of the foregoing corrective operations.

END OF SECTION 321723





SECTION 321726 - TACTILE WARNING SURFACING

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. Surface-applied detectable warning tiles.

- B. Related Requirements:

- 1. Section 321400 "Unit Paving" for unit paving installations incorporating detectable warning unit pavers specified in this Section.

1.3 ACTION SUBMITTALS

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

- B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

- C. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

1.5 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

- B. Weather Limitations for Adhesive Application:

- 1. Apply adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when substrate is wet or contains excess moisture.

C. Weather Limitations for Mortar and Grout:

1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks, and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
  - a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set unit pavers within 1 minute of spreading setting-bed mortar.

1.6 WARRANTY

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

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

- A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for tactile warning surfaces.
1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.
- B. Source Limitations: Obtain each type of tactile warning surfacing from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 DETECTABLE WARNING TILES

- A. Cast-in-Place Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles with replaceable surface configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
1. Product: As indicated on the drawings.

2. Material: Molded glass- and carbon-fiber-reinforced polyester.
  3. Color: Gray.
  4. Shapes and Sizes:
    - a. Rectangular panel, 24 by 48 inches.
  5. Dome Spacing and Configuration: Manufacturer's standard compliant spacing, in square pattern.
  6. Mounting:
    - a. Replaceable detectable warning tile wet-set into freshly poured concrete and surface-fastened to permanently embedded anchors.
- B. Setting Bed: Comply with requirements in Section 321400 "Unit Paving."
- C. Mortar Setting Bed at Perimeter:
1. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
  2. Sand: ASTM C 33/C 33M.
  3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.
  4. Thinset Mortar: Latex-modified portland cement mortar complying with ANSI A118.4.
  5. Water: Potable.

## 2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:
1. Furnish Type 316 stainless-steel fasteners for exterior use.
  2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF TACTILE WARNING SURFACING

- A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.
- B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

3.3 INSTALLATION OF DETECTABLE WARNING TILES

- A. Removable Cast-in-Place Detectable Warning Tiles:
  - 1. Concrete Paving Installation: Comply with installation requirements in Section 321313 "Concrete Paving." Mix, place, and finish concrete to conditions complying with detectable warning tile manufacturer's written requirements for satisfactory embedment of removable tile.
  - 2. Set each detectable warning tile accurately and firmly in place with embedding anchors and fasteners attached, and firmly seat tile back in wet concrete by tamping or vibrating. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
  - 3. Set surface of tile flush with surrounding concrete and adjacent tiles, with variations between tiles and between concrete and tiles not exceeding plus or minus 1/8 inch from flush.
  - 4. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.
  - 5. Clean tiles using methods recommended in writing by manufacturer.

3.4 CLEANING AND PROTECTION

- A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.
- B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION 321726

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## SECTION 321729 - TRAFFIC SIGNS

### 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 includes the following:
  - 1. Parking and Traffic signs.
  - 2. Directional signs.
  - 3. Information signs.

### PART 2 - PRODUCTS

#### 2.1 SIGNS

- A. Provide signs conforming to the requirements of MDOT standards and section 645 of the MUTCD standards.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install in conformance to the requirements of MDOT standards.

END OF SECTION 321729



SECTION 329300 - PLANTS

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. Plants.
  - 2. Planting soils.
  - 3. Tree stabilization.

1.3 ALLOWANCES

- A. Allowances for plants are specified in Division 01 Section "Allowances."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.
  - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
  - 2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
  - 3. Plant Photographs: Include color photographs of each required species and size of plant material as it will be furnished to the Project.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
  - 1. Manufacturer's certified analysis of standard products.
  - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Material Test Reports: For standardized ASTM D 5268 topsoil, imported or manufactured topsoil.
- D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.
- E. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
- B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
  - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
  - 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
  - 3. Report suitability of tested soil for plant growth.
    - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
    - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
  - 1. Selection of plants purchased under allowances will be made by Architect, who will tag plants at their place of growth before they are prepared for transplanting.
- E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
  - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
  - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- F. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject



unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable. Protect materials from deterioration during delivery, and while stored at the site.
- B. Plant Materials:
  1. In preparing plants for moving, all precautions customary in good trade practice shall be taken. All plants shall be dug immediately before moving unless otherwise specified. Broken, loose, or manufactured balls will be rejected.
  2. All plants shall be packed, transported, and handled with utmost care to insure adequate protection against injury and drying. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery.
  3. Deliver plant materials after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set all plants in shade, protect from weather and mechanical damage, and keep roots moist.
  4. Label all plant materials of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.
- C. Bulk Materials:
  1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- D. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- E. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- F. Handle planting stock by root ball.

- G. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- H. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
  - 1. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
  - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
  - 3. Do not remove container-grown stock from containers before time of planting.
  - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of each service or utility.
  - 2. Do not proceed with interruption of services or utilities without Architect's written permission.
- C. Planting Seasons: Unless variance is requested in writing and approved by the Owner's Representative, planting and seeding shall be done within the following dates:
  - 1. Plant Materials:
    - a. Potted and Container Spring: April 1 - July 15.
    - b. Grown Plants Fall: Aug. 15 - Nov. 15.
  - 2. Balled and Burlapped Spring: April 1 - June 15.
  - 3. Plants Fall: Aug. 15 - Oct. 15.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
    - b. Structural failures including plantings falling or blowing over.
    - c. Faulty performance of tree stabilization.
    - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Periods from Date of Planting Completion:
    - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
    - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
    - c. Annuals: Three months.
  - 3. Include the following remedial actions as a minimum:
    - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
    - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
    - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
    - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
  - 1. Maintenance Period: Six months from date of planting completion.
- B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
  - 1. Maintenance Period: Six months from date of planting completion.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
  - 1. All plants shall be nursery grown unless otherwise stated, and shall have been growing under the same climatic conditions as the location of this project for at least two (2) years prior to award date of this contract.
  - 2. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
  - 3. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.
- G. Deciduous Shrubs: Provide balled and burlapped (B&B) deciduous shrubs otherwise noted in plant list. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs as approved by the Owner's Representative.
- H. Coniferous and Broadleafed Evergreens: Provide balled and burlapped (B&B) evergreens. Container grown evergreens will be acceptable as approved by the Owner's Representative.

- I. Deciduous Trees: Provide balled and burlapped (B&B) deciduous trees unless otherwise noted in plant list. Container grown deciduous trees will be accepted in lieu of balled and burlapped deciduous trees as approved by the Owner's Representative.
- J. Ground Cover: Provide plants established and well-rooted in removable containers or integral peat pots and with no less than the minimum number and length of runners required by ANSI Z60.1 for the pot size shown or listed.

## 2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
  - 1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
  - 2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
  - 3. Provide lime in form of ground dolomitic limestone or calcitic limestone.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

## 2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
  - 1. Organic Matter Content: 50 to 60 percent of dry weight.
  - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

- B. Peat Humus: Peat humus shall be a natural peat approved by the Owner's Representative consisting of sedge, sphagnum or reed peat of such physical condition as will pass through a 1 in. screen and will be readily incorporated with the topsoil. The peat humus shall be free from sticks, stones, roots and other objectionable matter.
- C. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- D. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- E. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
  - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. of loose sawdust or ground bark.
- F. Manure: Manure shall be dehydrated processed, well-rotted manure subject to approval by the Owner's Representative. Manure shall be free of weeds, grass, or harmful chemicals.

#### 2.4 FERTILIZERS

- A. Fertilizer: Fertilizer shall contain available elements in conformity with the standards of the Association of Official Agricultural Chemists. The fertilizer shall indicate the weight, contents and guarantee analysis shown thereon or on a securely attached tag, as applicable.
  - 1. Granular fertilizer shall be a commercial grade fertilizer containing the following percentages of available nutrients by weight:
    - a. Nitrogen 10 percent
    - b. Phosphoric Acid 10 percent
    - c. Potash 10 percent
  - 2. Water soluble fertilizer shall be completely soluble in water and contain the following percentages of available nutrients by weight. It shall contain a coloring agent.
    - a. Nitrogen 16 percent
    - b. Phosphoric Acid 32 percent
    - c. Potash 16 percent
  - 3. Slow release fertilizer packets shall be slow release fertilizer contained in a polyethylene perforated bag with micropore holes. Each bag shall contain 4 ounces of minimum water soluble fertilizer to be effective for 8 years. Packages shall contain the following percentage of available elements by weight.
    - a. Nitrogen 20 percent
    - b. Phosphoric Acid 10 percent

- c. Potash 5 percent
- B. The Owner's Representative may approve the use of other fertilizers providing they contain an equivalent amount of nutrients in an acceptable form.

## 2.5 PLANTING SOILS

- A. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs, or marshes.
  - 1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
  - 2. Mix imported topsoil or manufactured topsoil with the following soil amendments in the following quantities to produce planting soil:
    - a. Ratio of Loose Compost to Topsoil by Volume: 1:4.

## 2.6 MULCHES

- A. Planting Bed Mulch: Provide shredded bark mulch for planting beds. Do not use material that is decayed or mixed with soil, weeds or other foreign matter. Use material that is large enough in size to prevent it from drifting and blowing in normal wind storms. Submit samples to Owner's Representative for approval prior to delivery of bark mulch to site.
- B. Mulch Binder: Material for mulch binder may be emulsified asphalt of a type acceptable to the Owner's Representative and may be diluted with water to assure even distribution. Other types of approved mulch binders may be used when authorized by the Owner's Representative.

## 2.7 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

2.8 TREE STABILIZATION MATERIALS

- A. Stakes and Guys: Provide stakes of sound new hardwood, free of known holes and other defects. Provide wire ties and guys of 2-strand, twisted, pliable galvanized iron wire not lighter than 12 ga. with zinc-coated turnbuckles or an approved equal. Provide new 2-ply garden hose not less than 1/2 in. hose size, cut to required lengths to protect tree trunks from damage by wires or an approved equal.
- B. Wrapping: Wrapping material for tree trunks shall be furnished in strips approximately 4 to 6 inches wide consisting of first quality, 8 oz. per sq. yd. burlap, approved waterproof paper tape or polyethylene film, ASTM D 2103.

2.9 MISCELLANEOUS PRODUCTS

- A. Anti-Desiccant: Emulsion type, film-forming agent or Wilt-Pruf by Nursery Specialty Products, Inc., designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.
- B. Water: Water used for landscape work shall be free from oil, acids, alkalis, salts, or other substances harmful to plants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
  - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.



- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
  - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- G. Preparation of Planting Soil: Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth. Mix specified soil amendments with topsoil at the rates specified. Unless otherwise specified or indicated on the Drawings, the following planting soil mixture (thoroughly mixed by volume) shall be used for backfill around trees and shrubs: dehydrated processed manure 1 part; topsoil 8 parts; peat moss 3 parts.

### 3.3 PLANTING AREA ESTABLISHMENT

- A. Preparation of Planting Beds: Loosen subgrade of planting bed areas to a minimum depth of 6 in. using a cultimulcher or similar equipment. Remove stones over 1 1/2 in. in any dimension, and sticks, stones, rubbish and other extraneous matter. Spread planting soil mixture to the 6" minimum depth and as required to meet lines, grades and elevations shown, after light rolling and natural settlement.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

### 3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Excavate pits in accordance with Typical Planting Details with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation. For balled and burlapped (B&B) trees and shrubs, make excavations at least twice as wide as the ball diameter and a minimum of 1 ft. 6 in. wider than root spread.
- B. Subsoil and topsoil removed from excavations may not be used as planting soil.

- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
  - 1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

### 3.5 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
  - 1. Use planting soil for backfill.
  - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set container-grown stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
  - 1. Use planting soil for backfill.
  - 2. Carefully remove root ball from container without damaging root ball or plant.
  - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.

- E. Set fabric bag-grown stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
  - 1. Use planting soil for backfill.
  - 2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
  
- F. Set and support bare-root stock in center of planting pit or trench with root flare 1 inch above adjacent finish grade.
  - 1. Use planting soil for backfill.
  - 2. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots.
  - 3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside soil-covered roots about 1 inch from root tips; do not place tablets in bottom of the hole or touching the roots.
  - 4. Continue backfilling process. Water again after placing and tamping final layer of soil.
  
- G. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.
  
- H. Dish completed planting pits to form shallow (4") saucer to collect water. Mulch pits, trenches and planted areas with at least 4 in. thickness of shredded bark or equivalent substitute approved by Owner's Representative.
  
- I. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage. If deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving and again 2 weeks after planting.
  
- J. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice. Remove dead, broken, or diseased branches. Prune trees to retain required height and spread. Unless otherwise directed by the Owner's Representative, do not cut tree leaders, and remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character and accomplish their use in the landscape design. Pruning cuts shall be made to outside the branch color or branch bark ridge; tree paint is not permitted. Required shrub sizes are the size after pruning. Remove and replace excessively pruned or misformed stock resulting from improper pruning.
  
- K. Wrap tree trunks of 2 in. caliper and larger. Start at ground and cover trunk to height of first branches and securely attach. Inspect tree trunks for injury, improper pruning and insect

infestation and take corrective measures required before wrapping. Wrapping shall only be present from November 1st to April 1st.

- L. Immediately after planting, guy and stake trees of 1-1/2 in. caliper or larger or over 6 ft. in height on planting schedule. Allow plants to have normal sway to promote strong growth.
- M. Plant labels shall be removed immediately after acceptance by Architect.

3.6 FERTILIZING TREES AND SHRUBS

A. Water Soluble Fertilizer:

- 1. The first liquid feeding will be permitted as the first watering only during backfilling of the plant, unless otherwise directed by the Owner's Representative. All seedlings will be liquid fed during planting. The second liquid feeding will be made the following spring season, no later than June 30th.
- 2. Liquid fertilizer shall be completely dissolved and mixed in water at the rate of 6 lbs. of the fertilizer concentrate to 100 gallons of water.
- 3. The resulting solution shall be poured in the plant pit as directed by the Owner's Representative. A second application at the same rate shall be applied as directed by the Owner's Representative. The solution shall be applied at the following rates for each application:
  - a. Plants up to 2 ft. in height shall receive 4 quarts.
  - b. Plants above 2 ft. and up to 6 ft. shall receive 6 quarts.
  - c. Plants above 6 ft. and up to 12 ft. shall receive 12 quarts.
  - d. Plants above 12 ft. shall receive 16 quarts.

B. Slow Release Fertilizer Packets:

- 1. All woody plants except evergreen seedlings shall be fertilized with slow release fertilizer packets at the time of planting, unless otherwise directed by the Owner's Representative. Fertilizer packets shall be placed equidistantly within the planting pit adjacent to the ball or root mass, but not in direct contact with roots. Placement depth shall be 6 to 8 inches. Packets shall not be cut, ripped or damaged.
- 2. If it becomes necessary to remove and replace dead or unhealthy plants, damaged or broken packets shall be replaced with new packets. The application rates shall be as follows:

Type of Plants	No. of Packets
Evergreen Trees	
Under 18 inches height	1
18 inches to 3 ft. height	2
3 ft. to 6 ft. height	3
Over 6 ft. height	4
Deciduous Trees	
Under 6 ft. height	2
6 ft. to 12 ft. height or under 4 in. caliper	3
Over 4 inches caliper	4

Shrubs

Under 2 ft. height or spread	1
2 ft. to 3 ft. height or spread	2
Over 3 ft. height or spread	3

Vines and Ground Covers	1
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3.7 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.8 TREE STABILIZATION

- A. Install trunk stabilization as follows unless otherwise indicated:
  - 1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension shown on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
  - 2. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
  - 3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
  - 4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.9 ROOT-BARRIER INSTALLATION

- A. Install root barrier where trees are planted within 48 inches of paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise shown on Drawings.
- B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.

- C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.
  - 1. Position top of root barrier 1/2 inch above finish grade.
  - 2. Overlap root barrier a minimum of 12 inches at joints.
  - 3. Do not distort or bend root barrier during construction activities.
  - 4. Do not install root barrier surrounding the root ball of tree.

3.10 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as recommended by plant supplier in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.11 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
  - 1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of 4-inch average thickness, with 36-inch radius around trunks or stems. Do not place mulch within 6 inches of trunks or stems.
  - 2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.12 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or

vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

### 3.13 PLANT ACCEPTANCE

- A. The acceptability of the plant material furnished and planted under this Contract shall be at the end of a period of establishment, during which the Contractor, as necessary, shall employ all possible means to preserve the plants in a healthy and vigorously growing condition and to insure their successful establishment. The establishment period shall extend for a period of one (1) calendar year from the date of final acceptance of the project. During this period, the Contractor shall water, cultivate and prune the plants, repair guy wires and stakes, mouse bait as may be required and do any other work necessary to maintain the plants in a healthy growing condition. This shall include seasonal spraying with approved insecticides or fungicides as may be required. The Contractor shall also be responsible for protecting the plants from mice and other rodents. All dead or rejected plants shall be promptly removed from the project and replaced by live healthy plants meeting the same specifications, if such plants are declared unacceptable during this planting season. Otherwise, they shall be replaced during the next subsequent planting season. No payment shall be made for unsatisfactory work during the establishment period.
- B. The period of establishment shall commence at the date of final acceptance. Necessary replacements shall be made so that at the time of final acceptance all plants shall be in a healthy, vigorous growing condition and free from sizable die-back.
- C. It shall be the sole responsibility of the Contractor to replace any unsatisfactory plants on the project regardless of whether they are specifically designated by the Owner's Representative. In the case of individual doubtful plants, the Contractor may call upon the Owner's Representative to make a determination as to their acceptability, but it shall not be incumbent on the Owner's Representative to furnish the Contractor with exact lists of replacements.
- D. All replacements of plants shall be completed by the end of the planting season prior to the final acceptance date. Any small quantity of plants which fail between the end of the planting season and the final acceptance date shall be canceled from the list of accepted plants and the Contractor will receive no payment for them. If a sizable number fails, the Owner's Representative may extend the date of final acceptance to the subsequent planting season, in which case, the Contractor will be subject to liquidated damages, to be established by the Owner's Representative. All replacement planting shall conform in every way to the requirements of the original planting. The Owner's Representative may require that any replacement plants that are not dormant, or that are planted late in the season, be sprayed, as directed, with an approved anti-desiccant.

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### 3.14 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

### 3.15 RESTORATION

- A. All pavements, seeded and planted areas, structures and substructures not specifically provided for in the contract disturbed by the Contractor during the execution of the work shall be restored by the Contractor, in a manner satisfactory to the Owner's Representative, to their original conditions at no additional cost to the Owner.

### 3.16 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 329300



SECTION 330513 – MANHOLES AND CATCH BASINS

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. This Section includes storm drainage structures outside the building, with the following components:
  - 1. Precast drainage manholes.
  - 2. Frames, covers and grates.
- B. Related Sections include the following:
  - 1. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.3 SUBMITTALS

- A. Product Data: Manufacturers' product data and installation instructions for frames, covers, grates, precast items, manhole sleeves, joint sealants and frost barrier.
- B. Shop Drawings: For the following:
  - 1. Manholes: Include plans, elevations, sections, details, and frames and covers. Include design calculations, and concrete design-mix report for cast-in-place manholes.
- C. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Provide complete manhole, and precast concrete structures capable of supporting AASHTO H20 loading.
- B. All precast concrete shall comply with ASTM C913 "Standard Specification for Precast Concrete Water and Wastewater Structures."
- C. Precast Manhole and Catch Basin Components: ASTM C478.
- D. Average strength of 4,000 psi at 28 days. Light pole bases shall have an average strength of 5,000 psi at 28 days.

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### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle manholes according to manufacturer's written rigging instructions.

## PART 2 - PRODUCTS

### 2.1 MANHOLES

- A. All sewer construction shall comply with the standards and specifications of the local Sewerage District.
- B. Provide complete manhole and precast concrete structures capable of supporting AASHTO H-20 loading. Precast concrete shall comply with ASTM C913 "Standard Specification for Precast Concrete Water and Wastewater Structures
- C. Base Sections: Precast monolithic construction with steps.
- D. Barrel Sections: Precast with steps.
- E. Top Sections: Precast eccentric cone with steps. Use flat cover only if shown on drawings.
- F. Steps: Conform to ASTM C478 for load carrying capacity and pull out resistance, installed at 12-inches on center forming a continuous ladder. Acceptable manufacturers: Reliabel Steel Products, Inc., M.A. Industries, Inc. or equal to above.
- G. Pipe to Manhole Connections:
  - 1. Pipe to Manhole connections shall be flexible, watertight manhole sleeves.
  - 2. Cast into the manole base and sized to the type of pipe being used
  - 3. Type of flexible joint being used shall be approved by the Engineer. Install materials according to the Manufacturer's instruction. Acceptable manufacturers; Lock Joint ny Interpace Corporation, Kor N Seal by Trelleborg, Press Wedge II by Press-Seal Gasket Corporation, A-Lok Manhole Pipe Seal by A-Loc Corporation, or approved equivalent.
- H. Joints Between Precast Sections: Watertight, shiplap type, seal with two rings of 1-inch diameter butyl rubber sealant.
- I. Waterproofing: The exterior surface of all manholes shall be given two coats of bituminous waterproofing material at an application rate of 75-100 square feet per gallon, per coat. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturers writing instruction. Sufficient time shall be allowed between coats to permit sufficient drying so that the application of the second coast has no affect on the first.

### 2.2 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
  - 1. Cement: ASTM C 150, Type II.

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2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

### 2.3 MASONRY MATERIALS

A. Concrete Masonry Units: ASTM C139.

B. Mortar: Type M, ASTM C270. Use Type II Portland cement, Type S lime. Proportions for Mortar: 1 part Portland cement, 1/4 part hydrated lime, 3 to 3 3/4 parts sand.

### 2.4 BRICK

A. Brick for manholes shall meet the latest AASHTO Specification Designation M-91.

### 2.5 FRAMES, GRATES AND COVERS

A. Cast iron: ASTM A48 Class 30.

B. Castings shall be smooth with no sharp edges.

C. Constructed to support H-20 loading.

D. Manhole frames and covers: Minimum 24" dia. opening, minimum weight 300 pounds.

1. Standard frame and cover: Castings shall be from East Jordan Foundry, refer to Contract Documents for casting model number and application.
2. Special frame and cover: Castings shall be 30" Pamrex Hinged Locking Cover by Pamm
3. Access Covers, or approved equal. Refer to Contract Documents.
4. Utility name shall be cast into cover.

### 2.6 MISCELLANEOUS

A. Joint Sealants: Butyl Rubber Sealant: One inch diameter strips as manufactured by Kent Seal, or Engineer approved equal.

- B. Dampproofing: Bituminous coating to be Dehydrate No. 4 Dampproof by W.R. Grace of Bitumastic Super Service Black by Koppers Co. for field application, or Engineer approved equal.

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

#### 3.2 MANHOLE INSTALLATION

- A. Placement: Place bases on compacted bedding material so manhole structure is plumb and pipe inverts are at proper elevations. Place barrel and top sections in the appropriate height combinations. Plug all lifting holes inside and out with non-shrink grout.
- B. Joints: Follow manufacturer's instructions for sealing joints between precast sections. Provide two rings of 1-inch diameter butyl rubber sealant. Point joints inside and out with butyl caulk.
- C. Frame and Covers: Set to final grade as shown on the Drawings or set flush with pavement grade in paved areas or 2" below finish grade in unpaved roads or 24" above grade in cross-country areas. Provide adequate temporary covers (conforming with applicable local, State and Federal regulations) to prevent accidental entry until final placement of frame and cover is made.
- D. Set manhole frames and covers to final grade only after pavement base course has been applied, or after final grading of gravel roads.
- E. Inverts: See detail on drawings.
- F. Steps: Replace steps out of plumb and out of proper horizontal placement.

#### 3.3 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318/318R.

#### 3.4 ALTERING EXISTING MANHOLES AND CATCH BASINS

- A. When altering existing manholes or catch basins, the structure shall be dismantled sufficiently to allow reconstruction in accordance with the applicable requirements as shown on the Drawings for complete manholes. Each altered manhole or catch basin shall be cleaned of all accumulated silt, debris or foreign matter prior to final acceptance of work.

3.5 FIELD QUALITY CONTROL

- A. Testing and Acceptance: All sanitary sewer components shall comply with the testing requirements of the Sanford Sewerage District.
1. General:
    - a. Perform either a vacuum test or combination of the exfiltration and infiltration tests on all manholes.
    - b. All testing must be performed in the presence of the District
    - c. Suitably plug all pipes entering each manhole and brace plugs to prevent blow out.
  2. Exfiltration Tests After Backfilling:
    - a. Fill each manhole with water to the top of the manhole frame.
    - b. A period of up to 2 hours may be permitted, if the Contractor so wishes, to allow for absorption.
    - c. At the end of the absorption period, refill each manhole with water to the top of the manhole frame and begin the 4-hour test period.
    - d. At the end of the 4-hour test period, refill each manhole to the top of the manhole frame and measure the volume of water added. The leakage for each manhole shall not exceed 1/16 gallon per foot of diameter per vertical foot (above ground water) per 4-hour period.
  3. Infiltration Tests:
    - a. When the groundwater is above the bottom of the manhole, infiltration testing may be performed on that portion of the manhole below water level.
    - b. After a 15-minute period, if no water is visibly moving down the interior surfaces of a manhole, the portion of the manhole below groundwater may be considered to be satisfactorily watertight.
    - c. The remaining portion above the groundwater level must be tested for exfiltration as specified above.
  4. Vacuum Test:
    - a. The manhole shall be tested by a vacuum test after assembly of the manhole, connection piping and backfilling.
    - b. Plug all lifting holes completely with non-shrink grout.
    - c. Properly tighten all boot clamps and brace all plugs to prevent them from being sucked into the manhole.
    - d. Install the testing equipment according to the manufacturer's instructions.
    - e. A vacuum of 10 inches of Hg shall be drawn on the manhole and the loss of 1 inch of Hg vacuum timed. The manhole shall be considered to have passed the test if the time for the loss of 1 inch of Hg vacuum is two (2) minutes or longer.
    - f. If the manhole fails the initial test, the Contractor shall locate the
    - g. If the manhole fails the initial test, the Contractor shall locate the leak(s) and make repairs. The manhole shall be retested until a satisfactory test result is obtained.
    - h. If a satisfactory vacuum test cannot be obtained, the manhole shall be water exfiltration tested and repaired as necessary.

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5. Manhole Repairs:
  - a. Correct leakage by reconstruction, replacement of gaskets and/or other methods as approved by the District.
  - b. The use of lead-wood or expanding mortar will not be permitted.
6. After the manholes have been backfilled and prior to final acceptance, any signs of leaks or weeping visible inside the manholes shall be repaired and the manhole made watertight.

END OF SECTION 330513

SECTION 330516 – UTILITY STRUCTURES

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. This Section includes storm drainage structures outside the building, with the following components:
  - 1. Concrete light bases.
  - 2. Electric/Tel-data manholes.
  - 3. Sidewalk vault.
- B. Related Sections include the following:
  - 1. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.3 SUBMITTALS

- A. Product Data: Manufacturers' product data and installation instructions for utility structures.
- B. Shop Drawings: For the following:
  - 1. Precast Concrete Items: Include plans, elevations, sections, details, and frames, covers, and grates.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Handle concrete structures according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 LIGHT POLE BASES

- A. As per Bayside Light requirements.

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2.2 ELECTRIC/TEL-DATA MANHOLES

A.

2.3 SIDEWALK VAULT

A. Refer to the information on the drawings.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 LIGHT POLE BASE INSTALLATION

A. Install as shown on drawings.

3.3 ELECTRIC/TEL-DATA MANHOLE INSTALLATION

A. Install as shown on drawings.

3.4 SIDEWALK VAULT INSTALLATION

- A. Vault shall be installed in strict accordance with the manufacturer's recommendations and according to plans and specifications.
- B. The sidewalk vault shall be installed on level, compacted bed of 8-inch thick 3/4" crushed stone.
- C. All joints shall be made watertight. Manufacturer shall seal joints with a plastic flexible gasket conforming to AASHTO M-198-75 for bitumen gasket.
- D. Vault shall be cleaned & emptied prior to installation of equipment.
- E. Vault shall be backfilled after placement with structural fill, compacted in lifts as defined in Section 312000 "Earth Moving." Backfill of all sides of structure shall be performed simultaneously to prevent unbalanced lateral pressures during construction.

END OF SECTION 330516



SECTION 331100 - WATER UTILITY DISTRIBUTION PIPING

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. This Section includes water-distribution piping and related components outside the building for water service, with the following components:
  - 1. Water mains.
  - 2. Water services.
  - 3. Water fittings.
- B. This Section includes water-distribution piping and related components outside the building for fire-service mains, with the following components:
  - 1. Water mains.
  - 2. Water services.
  - 3. Water fittings.
- C. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified local requirements.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

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2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store pipe, fittings, and seals in accordance with manufacturer's recommendations.
- B. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- C. Protect flanges, fittings, and specialties from moisture and dirt.
- D. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

### 1.6 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
  1. Notify Owner's Representative or Local Utility no fewer than two days in advance of proposed interruption of service.
  2. Do not proceed with interruption of water-distribution service without written authorization from Owner's Representative or Local Utility.

### 1.7 COORDINATION

- A. Coordinate connection to water main with utility company.

## PART 2 - PRODUCTS

### 2.1 DUCTILE-IRON PIPE AND FITTINGS

- A. Approved Manufacturers:
  1. American Cast Iron Pipe.
  2. Griffin Pipe.
  3. U.S. Pipe.
  4. Clow Pipe.
  5. McWain Pipe.
  6. Atlantic States Pipe
- B. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, Class 52, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated. The pipe to be centrifugally cast,

bituminous coated, double cement lined, seal-coated and manufactured in accordance with the latest revision of AWWA C150 and C151. Note that the cement lining called for above shall be twice the thickness specified in the latest ANSI Specification A21.4 and the interior to be asphalt seal-coated twice. The asphalt seal-coat to be such as not to impart taste or odor to the water contained therein.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, Class 52, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated. The pipe to be centrifugally cast, bituminous coated, double cement lined, seal-coated and manufactured in accordance with the latest revision of AWWA C150 and C151. Note that the cement lining called for above shall be twice the thickness specified in the latest ANSI Specification A21.4 and the interior to be asphalt seal-coated twice. The asphalt seal-coat to be such as not to impart taste or odor to the water contained therein.
1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  2. Gaskets: AWWA C111, rubber.
- D. Flanges: ASME 16.1, Class 125, cast iron.

## 2.2 DUCTILE IRON FITTINGS

- A. Material shall be ASTM A536 latest, grade 70-50-05, in accordance with AWWA C110 (latest revision) for fittings larger than 24" and C153 (latest revision) for fittings 3" thru 24".
- B. Fittings shall be cement lined AWWA C104 (latest revision) or fusion bonded epoxy coated with a 5 mil nominal thickness per AWWA C550 and C116.
- C. Interior seal coated AWWA C104 with minimum of 4 mils dry film thickness.
- D. Exterior bituminous coated, 4 mils minimum dry film thickness or fusion bonded epoxy coated with a 5 mil nominal thickness per AWWA C550 and C116.
- E. Sleeves shall not be cement lined, but shall be bituminous coated inside to 4 mils dry film thickness. All sleeves shall be long body type.
- F. Mechanical joint with accessories furnished: D.I. glands, gaskets, Cor-Ten T-bolts and nuts.
- G. Pressure Ratings:
  1. Class 350 pressure rating in accordance with AWWA C153 - 3"-24" sizes.
- H. The "compact design" fittings must provide adequate space for the MJ joint and accessories to be installed without special tools (i.e. Lowell wrench can be used).
- I. Approved Manufacturers

1. In conformance with Yarmouth Water District specifications.

### 2.3 RESTRAINED JOINT GASKETS

#### A. Approved Manufacturers:

1. American Fast-Grip Gasket – American Pipe.
2. Field Lok 350 Gasket – US Pipe.

#### B. All accepted restrained joint gaskets in the distribution system shall be rated in accordance with the performance requirements of ANSI/AWWA C111/A21.11.

#### C. Required Applications

1. Any hydrant branch or service with a distance greater than 18' shall have an approved restrained joint gasket in the bell ends.
2. Where a casing is required, all joints within the casing shall have an approved restrained joint gasket unless restrained joint pipe is used.
3. At any time as required by a PWD Engineer.
4. Any live service tap where there is a joint between the connection and the end of the service.

### 2.4 GATE VALVES

#### A. Approved Gate Valves

1. U.S.P.
2. AFC Series 2500
3. Mueller A-2360/61
4. Clow Series F6100

#### B. Valve shall meet the latest revision of the AWWA C-509 or C-515 Standard.

#### C. Valve shall have a smooth unobstructed water way which shall be a minimum diameter of the valve.

#### D. Valve ends to be specified and shall be furnished with Cor-ten (or equal) bolts and nuts.

#### E. Valve shall be rated for zero leak rate at 200 psi differential working pressure and have

1. 400 psi hydrostatic test for structural integrity.

#### F. Sealing - Valve shall have a minimum of 2 “O” rings situated such that the “O” rings above the thrust collar can be replaced with the valve under pressure and in the open position.

#### G. Stem - Valve stem shall:

1. open right with a stem nut made of grade D,E manganese bronze;
2. be non-rising;
3. be designed with a thrust collar integrally cast to the stem;

4. be designed with two (2) thrust washers, placed one above and one below the stem thrust collar;
  5. be constructed of grade D,E manganese bronze;
  6. be such that the thrust washers are made of a synthetic polymer with physical properties required.
- H. Valve Body: The body, including the stuffing box and the bonnet, shall be constructed of cast iron or ductile iron, meeting the latest revision of AWWA C-153.
- I. Valve Wedge:
1. shall be constructed of ductile iron (less guiding mechanism);
  2. shall be fully encapsulated and permanently bonded with a resilient elastomer;
  3. shall be constructed such to allow the flushing of any interior exposed surface during operations.
- J. Coatings:
1. the internal and external valve body, including the stuffing box, bonnet, and interior of the wedge shall be fusion bonded epoxy coated with 8 mils D.F.T.
  2. interior shall meet latest version of AWWA C-550.
  3. shall be holiday free, interior and exterior, per testing method described in AWWA C-550, Sec. 5.1.
- K. Operating Nut:
1. shall be two (2) inch square ductile iron:
  2. with a countersunk hold down nut (made of 316 stainless steel or silicone bronze). This applies to stems that are tapered; or
  3. with a stainless steel pin inserted thru the stem. This applies to stems of full diameter.
- L. Bolts – The seal plate and bonnet bolts shall be stainless steel (Type 316 or Type 304).
- M. Valves 12” nominal diameter and smaller shall be directly operated by the nut on the valve stem and mounted vertically. Number of turns to open or close shall closely match the formula:  $(3 \times D) + 2$ . For example, a 12” valve should open or close with approximately  $(3 \times 12) + 2 = 38$  turns of the operating nut.
- N. Valves larger than 12” nominal diameter shall be designed to be installed horizontally and shall have bevel gear operators driven by the operating nut. Valves 14” – 24” nominal diameter shall have 4:1 bevel gear operators. Valves with 30” – 36” nominal diameters shall have 6:1 bevel gear operators and valves with 42” – 48” nominal diameters shall have 8:1 bevel gear operators. Number of turns to open or close shall closely match the formula:  $((3 \times D) + 2)$  times the bevel gear ratio. For example, a 24” valve should open or close with approximately  $((3 \times 24) + 2) \times 4 = 296$  turns of the operating nut.
- O. General Provisions
1. Vendor shall identify any and all exceptions to the specifications.
  2. Vendor shall provide standard brochures for item quoted.

3. Vendor may be required to supply a valve for inspection and determination of coating process.

## 2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

### A. Tapping-Sleeve Assemblies:

1. Approved Manufacturers:
  - a. AFC.
  - b. Mueller Co.
  - c. U.S. Pipe.
  - d. Tyler / Union.
  - e. Powerseal Model 3490 and 3490MJ (Fabricated Steel)
2. For sizes 12" and smaller tapping sleeve shall be ductile iron or approved fabricated steel:
  - a. Tapping sleeve shall be mechanical joint with recessed outlet flange for tapping valve.
  - b. Tapping sleeve shall conform to AWWA C-207, Class D, with rated maximum working pressure of 200 psi.
  - c. The side rubber gaskets shall be rectangular in cross-section and fit into grooved channels in the casting. These gaskets shall extend the entire length of the sleeve and shall not require cutting or trimming to match MJ end gaskets.
  - d. Tapping sleeve shall be AB-CD pattern to permit use of plain rubber and ducktipped gaskets for various O.D. piping sizes.
  - e. Mechanical joint with accessories furnished; glands, gaskets, and Cor-Ten T-bolts and nuts or equal.
  - f. All flange outlet bolts shall be stainless steel (Type 304).
  - g. Interior and exterior to be bituminous coated with a minimum of 4 mils dry film thickness or fusion bonded epoxy coated.
  - h. The sleeve shall be provided with a 3/4" F.I.P.T. test port and brass lug.

### B. Valve Boxes:

1. The valve box bottom section shall be slide-type with bell-type base with bottom lip. Manufacturer: North American Manufacture
2. The valve box top section shall be slide-type, 36 inches long (minimum). No top flange and no "bead" or bottom flange. Manufacturer: North American Manufacture
3. The valve box cover shall be a 2" drop-type cover to fit the 7-1/4" opening of the top section. Manufacturer: Bibby St-Croix (no substitute)
4. The valve box intermediate (mid) section shall be slide-type with a minimum 3" belled bottom. Base section No. 645 may be used as an alternate. Manufacturer: North American Manufacture
5. Material shall be cast iron or ductile iron free from defects.
6. Interior and exterior of all components shall be bituminous coated with a minimum of 4 mils dry film thickness.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 INSTALLATION

A. General:

1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations, and in conformance with Local Water District's standards.
2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation. Minimum depth of cover for water main shall be 5' - 6".
3. Install adapters, as required, when connecting pipes constructed from different materials.

B. Pipe Laying:

1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
4. Excavate suitable holes for the joints so that only the barrel of the pipe received bearing pressure from the supporting material after placement.
5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.
6. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
7. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
8. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
9. Take all necessary precautions to prevent flotation of the pipe in the trench.

C. Temporary Plugs:

1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
3. Do not use the pipelines as conductors for trench drainage during construction.

D. Jointing Push-On Pipe:

1. Connect pipe in accordance with the latest manufacturer's instructions and recommendations.
2. Clear each pipe length, coupling and fitting of all debris and dirt before installation.
3. Shove home each length of pipe against the pipe previously laid and hold securely in position. Do not pull or cramp joints.
4. Make all pipe joints as watertight as possible with no visible leakage and no sand, silt, clay, or soil of any description entering the pipeline at the joints.
5. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.

E. Jointing Bolted Joints:

1. Before the pieces are assembled, remove rust-preventative coatings from machined surfaces.
2. Pipe Ends, Sockets, Sleeves, Housings, and Gaskets: Thoroughly clean and smooth burrs and other defects.

F. Jointing Mechanical Joints:

1. Thoroughly brush surfaces against which the gasket will come in contact with a wire brush prior to assembly of the joint.
2. Clean and lubricate the gasket, bell, and spigot by washing with soapy water.
3. Slip gland and gasket, in that order, over the spigot, and insert the spigot into the bell until it is correctly seated.
4. Seat gasket evenly in the bell at all points, centering the spigot, and press the gland firmly against the gasket.
5. After all bolts have been inserted and the nuts have been made up finger tight, progressively and uniformly tighten diametrically opposite nuts all around the joint to the proper tension by means of a torque wrench.
6. The correct range of torque as indicated by a torque wrench and the length of wrench (if not a torque wrench) used by an average man to produce such range of torque, is as follows:

TORQUE RANGE VALUES

Range of torque 60-90 ft.-lb.

Length of wrench 10 in.

7. If effective sealing of the joint is not attained at the maximum torque indicated above, disassemble the joint, thoroughly clean, and reassemble.
8. Do not overstress bolts to tighten a leaking joint.

G. Pipe Cutting:

1. Cut in accordance with manufacturer's recommendations.
2. Cut the pipe with a hand saw, metal-inserted abrasive wheel (except asbestocement pipe), or pipe cutter with blades (not rollers).
3. Examine all cut ends for possible cracks caused by cutting.

H. Pipe Insulation:



1. Install 2 in. thick x 4 ft. wide between pipe and culvert or over pipe when noted on plans.
  2. Between culvert and pipe, extend insulation 6 ft. each side of the culvert along the pipe.
  3. For dual pipe trenches the insulation shall be 8 ft. wide.
  4. Provide 6 in. sand blanket above and below insulation or as shown on Drawings.
- I. Pipe Deflection Allowances: Per manufacturer's recommendations or Local Water District recommendations, whichever is more stringent.
- J. Valve Installation:
1. Install in accordance with the specifications for the pipe to which they are to be connected.
  2. Make up valve joints in accordance with the Contract Drawings.
  3. The valves shall bear no stresses due to loads from the adjacent pipe.
  4. Inspect, clean, and lubricate before installation.
- K. Bracing and Blocking:
1. Block and anchor all bends,  $22\frac{1}{2}^\circ$  or greater, tees, plugs, etc. with concrete to prevent movement of the pipe in the joints due to internal or external pressures.
  2. Use thrust blocks behind all hydrants.
  3. Use 2'x2'x4' concrete blocks manufactured from Pepin Concrete or approved equal. If blocks are poured, wrap joints and bolts with poly before pouring concrete.
  4. Place concrete around fittings to the walls of the trench, as shown on the Drawings, so placed that joints may be caulked or tightened, if necessary.
  5. Do not backfill until the concrete has set.
  6. If the soil does not provide firm support for thrust block placement, provide retainer clamps and tie rods as shown on the Drawings and/or directed by the Owner's Representative.
  7. Thrust restraint glands for mechanical joint fittings manufactured by Megalug or Grip Ring.
- L. Air Vents and Blowoffs, Corporation Stops, Curb Stops, Valve Boxes, Copper Tubing and Styrofoam Insulation: Install in accordance with Local Water District requirements, the Drawings and as directed by the Engineer.
- M. Vertical Separation From Sanitary Sewer:
1. Whenever water mains must cross sewers, lay at such an elevation that the top of the sewer is at least 18 in. below the bottom of the water main.
  2. When the elevation of the sewer cannot be buried to meet the above requirements, center one full length of water main over the sewer so that both joints will be as far from the sewer as possible.
- N. Water Service Leads and Stops:
1. Provide and install corporation valves, water service leads, and curb stops for proposed building connections as shown on the Drawings, or where directed by the Architect.

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3.3 PRESSURE TESTING AND DISINFECTION

- A. Pressure testing and disinfection shall be in accordance with AWWA C600 and AWWA C651 standards.
- B. Pressure testing and disinfection shall be performed in strict accordance with Local Water District requirements.
- C. Pressure testing and disinfection shall be performed in the presence of the representative of the Yarmouth Water District and the Engineer.

END OF SECTION 331100

SECTION 333100 - SANITARY UTILITY SEWERAGE PIPING

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. This Section includes gravity-flow, non-pressure sanitary sewerage outside the building.

1.3 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water.

1.4 SUBMITTALS

- A. Product Data: For pipe and fittings.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified local requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.6 PROJECT CONDITIONS

- A. Portions of the existing sanitary sewer traversing the site shall remain active during construction and upon completion of project. Refer to Grading and Utility plan for proposed modification. Construction activities shall not interfere or impede existing flows. Damage to existing sewer infrastructure shall be repaired by Contractor at their expense.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

- A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

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- B. Provide commercially manufactured wyes or tees for service connections. Fitting must have single piece gasket.

### 2.2 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
  - 1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  - 2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

### 2.3 RIGID INSULATION

- A. Extruded closed – cell rigid foamed polystyrene, 2 inch thickness, width of trench, Styrofoam HI-60 by Dow Chemical, or approved equal.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
  - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use cast-in-place concrete supports or anchors.
  - 3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

- D. No pipe installed will be allowed to begin at any point other than a manhole or other appurtenance without the expressed consent of the Owner's Representative. The interior of each length of pipe will be swabbed and wiped clean before installing the next length. No length of pipe shall be installed until the previous length has had sufficient fine material placed and tamped about it to secure it firmly in place to prevent any disturbance. Bell ends shall be installed uphill. Whenever the work is stopped temporarily, or for any reason whatsoever, the end of the pipe shall be carefully protected against dirt, water, or other extraneous material. Bedding shall be as shown on the drawings.
- E. The pipe shall be bedded in a compact granular or stone pipe bedding placed on a flat trench bottom to the limits indicated on the drawings.
- F. The pipe shall be cut as necessary for appurtenances. Sufficient short lengths of pipe shall be furnished so that pipe entering and leaving appurtenances shall not be more than 2 feet in length measured from the inside face of the manhole.
- G. Pipe Cutting: The cutting of the pipe shall be done in accordance with the pipe manufacturer's recommendations. The pipe material shall be cut by using a saw or milling process, approved by the pipe manufacturer and not by using any impact device, such as a hammer and chisel, to break the pipe. The pipe shall be cut, not broken. The cut end of the pipe shall be square to the axis of the pipe and any rough edges ground smooth.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
  - 1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric gasket joints.
  - 2. Join dissimilar pipe materials with nonpressure-type flexible couplings.

### 3.4 PIPE INSULATION

- A. Install 2-in. thick x 4-ft. wide insulation over pipe when noted on plans or as directed by the Owner's Representative.

### 3.5 CLOSING ABANDONED SANITARY SEWERAGE PIPING

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
  - 1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
  - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Backfill to grade according to Division 31 Section "Earth Moving."

3.6 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
  - 1. Use detectable warning tape over nonferrous piping.

3.7 FIELD QUALITY CONTROL AND TESTING

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspection to be performed with Owner's Representative present. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
- C. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
  - 1. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
  - 2. Close openings in system and fill with water.
  - 3. Purge air and refill with water.
  - 4. Disconnect water supply.
  - 5. Test and inspect joints for leaks.
  - 6. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.

- D. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
1. Equipment Requirements:
    - a. Pneumatic Plugs: Sealing length equal to or greater than the diameter of the pipe to be tested.
    - b. Pneumatic Plugs: Size and type to resist internal test pressures without requiring external bracing or blocking.
    - c. All air used shall pass through a single control panel.
    - d. Use three individual hoses for the following connections:
      - 1) From control panel to pneumatic plugs for inflation.
      - 2) From control panel to sealed line for introducing the low pressure air.
      - 3) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
  2. Procedures:
    - a. Pneumatic Plug Seal Testing:
      - 1) Before being used in the actual test installation, lay one length of pipe on the ground and seal at both ends with the pneumatic plugs to be checked.
      - 2) Introduce air into the plugs to 25 psig.
      - 3) Sealed pipe shall be pressurized to 5 psig.
      - 4) The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
    - b. Pipe:
      - 1) Place plugs in the line and inflate to 25 psig.
      - 2) Introduce low pressure air into sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of groundwater over the pipe.
      - 3) Wait at least two minutes for the air pressure to stabilize.
      - 4) After the stabilization (3.5 psig minimum pressure in the pipe), disconnect the air hose from the control panel to the air supply. The portion of line being tested shall be termed "acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that may be over the pipe) is greater than 4 minutes.
    - c. Where Groundwater is Known to Exist:
      - 1) Install a one-half inch diameter capped pipe nipple, approximately 10' long, through the manhole wall on top of one of the pipes entering the manhole, at the time the pipe is installed.
      - 2) Immediately prior to the performance of the Line Acceptance Test, determine the groundwater by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connect a clear plastic tube to the nipple.

3) The hose shall be held vertically and a measurement of the height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig, add the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same).

d. Should the pipe, as laid, fail to meet these requirements, perform the necessary work to meet these requirements, without additional cost to the Owner.

E. Leaks and loss in test pressure constitute defects that must be repaired.

F. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 3.8 INFILTRATION AND EXFILTRATION TESTS

A. If the installation fails to meet the above requirements for the air test, the Contractor may either run an Exfiltration or infiltration test, as directed and if approved by the Engineer.

B. Leakage shall not exceed 100 gallons per inch diameter/day/mile of pipe, when tested by either internal pressure or external pressure means. Should the pipe, as laid, fail to meet these requirements, the Contractor shall perform the necessary work at his expense to meet these requirements. Where groundwater is high, the Engineer may elect to accept infiltration measurements in lieu of exfiltration tests.

C. Infiltration Tests:

1. Requires groundwater levels to be a minimum of one foot above the crown of the pipe of the high end of the section being tested.

2. Infiltration Test Procedures:

- a. Engineer to determine length of sewer main and connecting lines to be tested.
- b. No more than 1,000 feet of sewer main is to be laid before testing.
- c. With all connecting pipes plugged (other than those included in test section) install a V notch weir in downstream end of pipe.
- d. Allow time for water to buildup behind weir until steady, uniform flow passes through V notch.
- e. Take and record readings under direction of the Engineer.

D. Exfiltration Test:

1. Procedures:

- a. Engineer to determine length of sewer to be tested.
- b. Properly cap or plug and block service laterals, stubs and fitting into sewer lines being tested.
- c. Plug downstream ends of test section providing a water supply connection standpipe in manhole upstream.
- d. Fill test section and upstream standpipe and allow time for water absorption in manholes.



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- e. Measure drop in upstream standpipe over 4 - 15 minute periods and compute leakage.

3.9 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 333100



SECTION 334100 - STORM UTILITY DRAINAGE PIPING

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. This Section includes gravity-flow, nonpressure storm drainage outside the building, with the following components:
  - 1. Storm drain piping.

1.3 DEFINITIONS

- A. PE: Polyethylene plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be at least silttight, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Storm drain piping.
- B. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- C. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- D. Field quality-control test reports.

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### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.

### 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of service without Architect's written permission.

## 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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

### 2.3 PE PIPE AND FITTINGS

- A. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
  - 1. Product: N-12 ST by Advanced Drainage Systems, Inc. (ADS)

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING APPLICATIONS

- A. Gravity-Flow, Nonpressure Sewer Piping: Use the following pipe materials for each size range:
  - 1. NPS 8 to NPS 12: Corrugated PE drainage pipe and fittings in NPS 8 and NPS 10 and corrugated PE pipe and fittings in NPS 12, silttight couplings, and coupled joints.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow.
  - 2. Install piping below frost line.
  - 3. Install PE corrugated sewer piping according to CPPA's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

3.4 PIPE JOINT CONSTRUCTION

- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure drainage piping according to the following:
  - 1. Join corrugated PE piping according to CPPA 100 and the following:
    - a. Use silttight couplings for Type 2, silttight joints.
- C. Join dissimilar pipe materials with pressure-type couplings.

3.5 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

3.6 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
  - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.7 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
  - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    - b. Option: Test plastic piping according to ASTM F 1417.
    - c. Option: Test concrete piping according to ASTM C 924.

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- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.8 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334100