



PROJECT MANUAL

FOR

NEWPORT NEWS PUBLIC SCHOOLS HEALTH SCIENCES ACADEMY

NEWPORT NEWS, VIRGINIA

NEWPORT NEWS PUBLIC SCHOOLS



**IFB NUMBER: 030-0-2022GS
VDOE NUMBER: 117-107-01-103**

**VOLUME 1
DIVISION 1 THROUGH DIVISION 27**

**Bid Set
June 8, 2022**

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 PROJECT

- A. Project Name: Heath Sciences Academy.
- B. Owner's Name: Newport News Public Schools.
- C. The Health Sciences Academy is an interior renovation that strives to re-use as much as possible of the existing conditions. New elevator is installed to address accessibility while glass in the corridors create opportunities for visibility and supervision, provide natural and borrowed light, and science on display. Removal of one of the non-bearing corridor walls allow for new opportunities for collaboration to activate the corridor. New ceiling and lighting throughout as well as new sprinkler system.

1.2 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in the Agreement.

1.3 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.4 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.5 WARRANTY

- A. The contractor shall provide a 1-year warranty for all work, materials and equipment, unless a longer warranty is required by the specific specification sections.

1.6 CONCURRENT WORK

- A. The Owner reserves the right to perform concurrent work in the area at the same time as this project. Contractor shall cooperate with Owner's contractors if required.

1.7 SPECIAL CONSIDERATIONS

- A. The following special considerations shall be carefully reviewed and considered by the contractor in preparation of their bids. No additional compensation will be allowed due to the contractor failing to properly understand and include costs associated with these items in their bid.
 - 1. All materials, equipment and furnishings in the area of Work will be removed by the Owner prior to construction.
 - 2. Site to be bid as "Unclassified" to subgrade elevations. Unclassified excavated materials may include rock, soil materials, obstructions, and other buried debris. No changes in the contract sum or contract time will be permitted for rock excavation, removal of unsuitable

soils and removal of other obstructions for work down to the subgrade. When subgrade is reached, if additional work is required by the geotechnical engineer, that work will be considered as an additional service.

3. Quality of the topsoil has not been tested. Contractor must test the topsoil during the bidding phase and include in their bid any costs associated with amending the topsoil in order to meet the requirements of the specifications.

1.8 CORRELATION AND INTENT OF THE CONSTRUCTION DOCUMENTS

- A. Design requirements when either drawn or specified, or both, shall prevail over the standard product of the companies specified. Any deviation from such must have the approval of the Architect and Owner.
- B. It is the responsibility of the Contractor to construct the work under this Contract so that it will be complete and finished in every detail. If mention has been omitted in the Contract Documents of any item of work or materials usually furnished or necessary for the completion or proper functioning of the project, it will be included without extra cost.
- C. All systems in all divisions are to be bid and constructed as wholly closed, connected and fully working systems. Any doubts by the Contractor as to the intent of the Contract Document requirements for such total system shall be verified before bidding.
- D. Whenever a conflict exists between drawings, drawings and specifications, or between specifications, the more stringent and costlier shall apply. Items specified but not shown on drawings must be supplied. Items shown on the drawings but not specified must be supplied. The Architect is to be notified of the conflict to determine the final precedent to follow.
- E. If there is a conflict between the General Conditions and the Specifications, the more stringent and costlier shall apply unless clarified during bidding.
- F. Where a device or piece of equipment is referred to in the singular number, such reference shall be deemed to apply to as many devices as are required to complete the installation.

1.9 ACCESSIBILITY

- A. Contractor to be aware of current Accessibility Standards for Accessible Design as indicated on the drawings and shall complete construction in compliance with these standards.

1.10 UTILITY COORDINATION

- A. Contractor bears the responsibility of being the main correspondent between the Project and all utilities inherent in the Project. The Contractor's duties shall include the following:
 1. Contractor is solely responsible for the coordination of all utilities inherent in the Project, both new and keeping the existing in operation. Any delay in response to the Contractor's requests and submittals by any of the project's utility companies will be considered non-compensable should the delay effect the construction critical path of the project's sequence of construction.
 2. Contractor is solely responsible for all bond and permit costs for all utilities required by the Project.

1.11 PERMITTING

- A. Contractor is responsible for obtaining all project related permits.
 1. Fee for building permit will be waived due to project being a Newport News Public Schools project.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 01 10 00

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SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and bonds and insurance.
 - 1. Identify site mobilization and bonds and insurance.
 - 2. Include additional line items identified by subsection titles, for Work exceeding \$15,000.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.3 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Present required information in typewritten form.
- E. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- I. Submit one electronic and three hard-copies of each Application for Payment.
- J. Include the following with the application:
 - 1. Revised Schedule of Values to list approved Change Orders.
 - 2. Transmittal letter as specified for submittals in Section 01 30 00.
 - 3. Construction progress schedule, revised and current as specified in Section 01 32 16.
 - 4. Current construction photographs specified in Section 01 30 00.

5. Signed release forms for Architect's and Architect's Consultants' drawing files, as required in Section 01 30 00.
 6. Partial release of liens from major subcontractors and vendors.
 7. Sustainable Design submittals applicable to work for which application is being made.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
- L. Clearly indicate on the Application for Payment those line items which include materials or equipment, purchased or fabricated and stored, but not yet installed.
1. Differentiate between items stored on-site and items stored off-site.
 2. Payments for material and equipment stored off-site will be at the sole discretion of the Owner. If required, Contractor will be responsible for all costs of travel and lodging for Architect, Engineers, and Owner to off-site storage locations to examine these items and the conditions of storage.
 3. For items stored off-site, provide a bill of sale from supplier/Trade Contractors and certificates of insurance for the full value of stored materials with the Owner named as the insured.
 4. For items stored off-site show a separate line item for the value of delivering and unloading the items at the Project site.
 5. For items stored on or off-site, provide in a separate line item for the value of the installation of these items.
- M. 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. Staff names and assignments.
 3. Schedule of Values.
 4. Contractor's Construction Schedule (preliminary if not final).
 5. Products list.
 6. Schedule of unit prices.
 7. Submittals Schedule (preliminary if not final).
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Certificates of insurance and insurance policies.
 12. Performance and payment bonds.
 13. Data needed to acquire Owner's insurance.
- N. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- 1.4 MODIFICATION PROCEDURES
- A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.
 - B. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.
 - C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.
- E. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- G. Substantiation of Costs: Provide full information required for evaluation.
1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Credit for deletions from Contract, similarly documented.
 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- J. Promptly enter changes in Project Record Documents.
- 1.5 APPLICATION FOR FINAL PAYMENT
- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 01 70 00 Section 01 77 00 and Section 01 78 00.

2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 20 00

SECTION 01 23 00 - ADDITIVE BIDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Administrative and procedural requirements for Additive Bids.

1.2 DEFINITIONS

- A. Additive Bid: 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. The cost or credit for each additive bid is the net addition to or deduction from the Contract Sum to incorporate additive bid into the Work. No other adjustments are made to the Contract Sum.
 - 2. Include as part of each additive bid, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate. Include costs of related coordination, modification, or adjustment.

1.3 ACCEPTANCE OF ADDITIVE BIDS

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

1.4 SCHEDULE OF ADDITIVE BIDS

- A. Additive Bid No. 1: Ceiling Demolition
 - 1. Base Bid: Include demolition of all elements related to ceiling as indicated on the drawings.
 - 2. Additive Bid: Do not include demolition of elements related to ceiling indicated on the drawings.
- B. Additive Bid No. 2: Interior Openings.
 - 1. Base Bid: Where indicated as aluminum storefront for new interior openings, provide aluminum storefront as specified in Section 08 41 13 – Aluminum-Framed Entrances and Storefronts.
 - 2. Additive Bid: In lieu of aluminum storefront for new interior openings specified in Section 08 41 13 – Aluminum-Framed Entrances and Storefronts, provide hollow metal frames specified in Section 08 11 13 – Hollow Metal Doors and Frames.
- C. Additive Bid No. 3: Existing Hollow Metal Doors.
 - 1. Base Bid: Replace existing hollow metal doors, hardware, and glass as indicated on the drawings and in the specifications.
 - 2. Additive Bid: Retain existing hollow metal doors and hardware and replace all glass with new undivided tempered half glass.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 23 00

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SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Procedural requirements for proposed substitutions.

1.2 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies and equipment. Architect will not consider requests for substitution after defined time period, except for extenuating circumstances described below; requests may be considered or rejected at discretion of Architect.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. The specification permits "Or Equal", or similar language defined in the project manual.
 - b. Unavailability.
 - c. Regulatory changes.
 - d. The specified product is identified as incompatible or inappropriate for the project.
 - e. The manufacturer or fabricator declares a specified product to be unsuitable for the use intended and refuses to warrant its installation, and where the Contractor certifies that the proposed substitution provides the required warranty.
 - f. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.
 - 3. "Or Equal" Provision:
 - a. Similarly, a statement such as "equal product of other named manufacturers" will require compliance to the Comparable Product process, including the use of a Substitution Request Form. Refer to Section 01 60 00 Product Requirements for additional information.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.

5. Waives claims for additional costs or time extension that may subsequently become apparent.
 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary to provide an actionable response.
1. Use forms included in the Project Manual; requests without completed form will not be reviewed.
 2. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - b. Substitution Request Information:
 - 1) Indication of whether the substitution is for cause or convenience.
 - 2) Issue date.
 - 3) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 4) Description of Substitution.
 - 5) Reason why the specified item cannot be provided.
 - 6) Differences between proposed substitution and specified item.
 - 7) Description of how proposed substitution affects other parts of work.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified and provided by named products, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Sustainable design features.
 - 6) Warranties.
 - 7) Other salient features and requirements.
 - d. Include the following types of documentation:
 - 1) Product data.
 - 2) Samples.
 - 3) Certificates, test, reports or similar qualification data.
 - 4) Drawings, when required to show impact on adjacent construction elements.
 - 5) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - 6) Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - 7) Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall contract time. If specified product or method of construction cannot be provided within the contract time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - 8) Cost benefit to the Owner.
 - 9) Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

- 10) 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.
 - e. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
 - D. Limit each request to a single proposed substitution item.
 - E. Submit an electronic document, combining the request form with supporting data into single document.
- 3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT
- A. Owner will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.
- 3.3 SUBSTITUTION PROCEDURES DURING CONSTRUCTION
- A. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 - B. Substitutions for Convenience: Architect will consider request for substitution if received prior to or with submission of Proposed Product List. Requests received after that time may be considered or rejected at discretion of Architect.
 - C. Substitutions will not be considered under one or more of the following circumstances:
 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 2. Without a separate written request.
 3. Without substantial cost savings benefit to the Owner.
- 3.4 RESOLUTION
- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- 3.5 ACCEPTANCE
- A. Architects notification of acceptance will be in the following forms:
 1. During Bidding: Indicated within an Addendum.
 2. After Contract signing: Change Order.
 - B. Use product specified if Architect cannot make a decision on use of a proposed substitution due to incomplete documentation.
 - C. During bidding, absence or mention within Addenda is to be interpreted as rejection of proposed substitution.
- 3.6 CLOSEOUT ACTIVITIES
- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
 - B. Include completed Substitution Request Forms as part of the Project record.
- 3.7 ATTACHMENTS
- A. Grimm + Parker Architects Substitution Request Form.

END OF SECTION 01 25 00

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Substitution Request Form

IDENTIFICATION:

Contractor/CM: _____

Project Name: _____

Date: _____

REFERENCE:

Specification Title: _____

Specification No.: _____ Page: _____ Article/ Paragraph: _____

DESCRIPTION:

Proposed Substitution: _____

Manufacturer: _____

History: New Product 2-5 years old 5-10 years old More than 10 years old

Reason for requesting substitution: Cause Convenience

Explain: _____

Differences between proposed substitution and specified item: _____

(Use attachment for additional space, if required.)

Proposed substitution affects other parts of Work or applicable Code requirements as follows: _____

(Use attachment for additional space, if required.)

Post-Bid Savings to Owner for accepting substitution: (N/A Pre-Bid) _____

Change to Contract Time due to accepting substitution: _____

LEED Contribution (if applicable to Project) - Explain effects to LEED Action Plan: _____

(Use attachment for additional space, if required.)

Will undersigned pay any costs caused by the substitution necessitating changes to the building design, construction, engineering and detailing, including additional Architect, inspection and testing fees? Yes No

Does the undersigned waive rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results? Yes No

Submitted by: _____
(Contractor or CM Only)

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

SUPPORTING DATA ATTACHED:

- Point-by-Point Comparative Data Attached (Required)
- Completed Section 01 61 16.01, Accessory Material VOC Content Certification Form Attached (Required)
- Drawings Product Data Samples Tests Reports _____

CERTIFICATION:

The Undersigned certifies:

- Proposed substitution has been investigated and determined that it meets or exceeds the quality level of the specified product.
- Same warranty will be furnished for proposed substitution as for specified product; **provide attachment if different.**
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances; **provide attachment if otherwise.**
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
- Neither the Owner and Architect will be liable for license fees or royalties.

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SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Electronic document submittal service.
- B. Project coordination.
- C. Requests for interpretation (RFI).
- D. Subcontract list.
- E. Staff names and assignments.
- F. Preconstruction meeting.
- G. Progress meetings.
- H. Contractor's daily reports.
- I. Progress photographs.
- J. Submittals for review, information and project closeout.
- K. Number of copies of submittals.
- L. Submittal procedures.
- M. Contractor's use of Architect's CAD files.
- N. Delegated design.
- O. Contractor's review.
- P. Architect's action.

1.2 PROJECT COORDINATOR

- A. Project Coordinator: General Contractor.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 50 00 - Temporary Facilities and Controls.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Closeout submittals.

1.3 SUBCONTRACT LIST

- A. Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use form reviewed and accepted by Owner and Architect. 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.
 4. Number of Copies: Submit four copies of subcontractor list, unless otherwise indicated. Architect will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
 5. Submit after award of contract and prior to or with second full-month Application for Payment.

1.4 STAFF NAMES AND ASSIGNMENTS

- A. Submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site, prior to or coinciding with initial Application for Payment.
- B. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers.
- C. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
- D. Post copies of list in Project meeting room, in temporary field office, and by each temporary phone.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 ADMINISTRATIVE SUBMITTAL MILESTONE SCHEDULE

- A. This list of administrative submittals includes, but not limited to, requirements included by Contract and this Project Manual.
- B. Failure to make critical administrative submittals, tied to specified payment applications, can result in held payment applications; Architect may recommend full or partial withholding of stipulated payment application, until submission of required administrative submittals.
- C. Milestone Schedule does not include itemized closeout submittals by section reference.
- D. Milestones:
1. Schedule of Values; Section 01 20 00 - Price and Payment Procedures.
 - a. 15 days after date of Owner-Contractor Agreement.
 - b. Revise schedule to list approved Change Orders, with each Application for Payment.
 2. Section 01 30 00 - Administrative Requirements.
 - a. Change Order Request resulting from RFI Response:
 - 1) 10 days of receipt of the RFI response.
 - 2) Contractor waives any right to make a claim by not initiating action within this 10-day duration of time.
 - b. Subcontract List: Submit.

- c. Staff Names and Assignments: Submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site, prior to or coinciding with initial Application for Payment.
 - d. Daily Construction Reports: Submit electronically via Electronic Document Submittal Service at a weekly interval.
 - e. Progress Photographs: Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
3. Coordination Drawings; Section 01 31 14 - Facility Services Coordination.
 - a. Complete the requirements for Coordination Drawings within 75 days of starting construction operations.
4. Section 01 32 16 - Construction Progress Schedule.
 - a. Construction Progress Schedule:
 - 1) Within 15 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
 - 2) If preliminary schedule requires revision after review, submit revised schedule within 10 days.
 - 3) Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 4) Within 10 days after joint review, submit complete schedule.
 - 5) Submit updated schedule with each Application for Payment.
 - b. Submittal Schedule:
 - 1) Submit prior to or with second full month Application for Payment.
 - 2) All submittals must be submitted prior to 50 percent completion of the Project.
5. Section 01 40 00 - Quality Requirements.
 - a. Schedule of Tests and Inspections: Prepare in tabular form, within 30 days following mobilization Preconstruction Conference.
 - b. Test Reports: Submit report within 15 days after each test or inspection.
 - c. Manufacturer's Field Reports: Submit report in duplicate within 30 days of observation to Architect for information.
6. Section 01 52 13 - Field Offices and Sheds.
 - a. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
7. Section 01 57 19 - Temporary Environmental Controls.
 - a. Indoor Air Quality Management Plan: Submit not less than 60 days before enclosure of building.
8. Section 01 60 00 - Product Requirements.
 - a. Proposed Product List: Submit prior to or with second full month Application for Payment. Failure to comply with submission date will obligate Contractor to providing Basis-of-Design products where named in the specification, in order to allow associated trades to determine their coordination issues.
 - b. Comparable Product Request Submittals: Submit Comparable Product requests prior to or with second full month Application for Payment.
 - c. Substitution Requests: Architect will not consider requests for substitution, after Bid, except for extenuating circumstances described within referenced section.
9. Section 01 71 23 - Field Engineering.
 - a. Submit daily reports, with content as indicated in this section.
 - b. Closeout Submittal: Final property survey.

10. Section 01 78 00 - Closeout Submittals.
 - a. With each application for payment, provide written certification that Project Record Documents are current at time application is submitted.
 - b. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work.
 - c. Operation and Maintenance Data:
 - 1) Manual Content Submittal: 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.
 - 2) Initial Manual Submittal: Submit draft copy of each manual at least 90 days calendar days before commencing demonstration and training.
 - 3) Final Draft Manual Submittal: Submit revised draft copy of each manual that was found unacceptable by Architect or Owner at least 30 calendar days before commencing demonstration and training.
 - d. Warranties and Bonds: Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

3.2 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 2. Contractor and Architect are required to use this service.
 3. It is Contractor's responsibility to submit documents in allowable format to the service.
 4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.
- C. Submittal Service - The selected service is:
 1. Newforma ConstructEx: www.newformaprojectcloud.com.
- D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

- E. Project Closeout: Architect will determine when to terminate the service for the project, Contractor shall obtain an archive copy of the project files from the service for the Architect and Owner.

3.3 PRECONSTRUCTION MEETING

- A. Architect or Construction Manager will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor's key personnel, including major subcontractors.
 - 4. Construction Manager's key personnel.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - a. Contract price.
 - b. Accepted alternate bids.
 - 2. Designation of personnel representing the parties to Contract:
 - a. Owner construction representative.
 - b. Architect representative.
 - c. General Contractor's Project Manager.
 - d. Construction superintendent(s).
 - e. Sustainability consultant.
 - f. Commissioning authority.
 - 3. Project dates.
 - 4. Status of permits.
 - 5. Administrative and submittal milestones.
 - 6. Procedures and processing of RFI's, field decisions, submittals, substitutions, applications for payments, proposal request, change orders, retainage, and retainage reduction procedures.
 - a. Required use of project management software.
 - b. Email policy.
 - c. Large data file transfer.
 - 7. Scheduling:
 - a. Critical lead time items.
 - b. Submittal schedule.
 - 8. Architect's CAD sharing.
 - 9. Sustainable Design project requirements.
 - 10. Testing and laboratory services; Special Inspections.
 - 11. Temporary facilities and controls.
 - 12. Use of site.
 - 13. Contract closeout procedures:
 - a. Substantial Completion.
 - b. Start of warranty periods of systems and assemblies.
 - c. Project warranty.
- D. Architect to record minutes and post to web based project management software within two days after meeting.

3.4 PROGRESS MEETINGS

- A. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

- B. Attendance Required: Contractor's project manager and job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
- C. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Review requests of trade contractors to receive Architect's and Architect's Consultants' drawing files and confirm receipt of required release forms.
 - 8. Maintenance of progress schedule.
 - 9. Corrective measures to regain projected schedules.
 - 10. Planned progress during succeeding work period.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Sustainable Design requirements and documentation progress.
 - 14. Other business relating to work.
- D. Architect to record minutes and post to web-based project management software within five days after meeting.

3.5 DAILY CONSTRUCTION REPORTS

- A. Submit electronically via Electronic Document Submittal Service at a weekly interval.
- B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 - 1. Date.
 - 2. High and low temperatures, and general weather conditions.
 - 3. List of subcontractors at Project site.
 - 4. Approximate count of personnel at Project site for each trade.
 - 5. List of construction activities performed (for each trade).
 - 6. Major equipment at Project site.
 - 7. Safety, environmental, or industrial relations incidents.
 - 8. Meetings and significant decisions.
 - 9. Accidents and unusual events (submit a separate special report).
 - 10. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 - 11. Meter readings and similar recordings.
 - 12. Emergency procedures.
 - 13. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
 - 14. Change Orders received and implemented.
 - 15. Testing and/or inspections performed.
 - 16. Services connected or disconnected.
 - 17. Equipment or systems tests and start-ups.
 - 18. Partial completions, occupancies.
 - 19. Signature of Contractor's authorized representative.

3.6 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.

- C. Provide photographs of site and construction throughout progress of Work produced by a photographer, acceptable to Architect.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Excavations in progress.
 - 2. Foundations in progress and upon completion.
 - 3. Structural framing in progress and upon completion.
 - 4. Enclosure of building, upon completion.
 - 5. Final completion, minimum of ten (10) photos.
- E. Views:
 - 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 - 2. Consult with Architect for instructions on views required.
 - 3. Provide factual presentation.
 - 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- F. Digital Photographs: 24-bit color, minimum resolution of 1600 by 1200 ("2 megapixel"), in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
 - 4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.
- G. Additional Photographic Requirements: Refer to Section 01 57 21 for photographic documentation requirements for Indoor Air Quality Controls.

3.7 REQUESTS FOR INTERPRETATION (RFIS)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 - 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 - 3. Frivolous RFIs: The Contractor will compensate the Owner for the Architect's time and expenses to process RFIs resulting from the Contractor's lack of studying and comparing the Contract Documents, coordinating their own Work, or repeating previous RFIs.
 - 4. Submit RFIs through the Web-based Project Management Software, in PDF format.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Contractor.
 - 4. Name of Architect.
 - 5. RFI number, numbered sequentially.
 - 6. Specification Section number and title and related paragraphs, as appropriate.
 - 7. Drawing number and detail references, as appropriate.
 - 8. Field dimensions and conditions, as appropriate.
 - 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 10. Contractor's signature.

11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
 - C. Format of RFIs:
 1. Software-Generated RFIs:
 - a. Preferred format.
 - b. Software-generated form with substantially the same content as indicated above.
 - c. Photographs shall be electronic files in JPG format.
 - d. Attachments shall be electronic files in Adobe Acrobat PDF format.
 2. Hard-Copy RFIs:
 - a. Permitted under conditions where electronic RFI is not feasible.
 - b. Identify each page of attachments with the RFI number and sequential page number.
 - D. Architect's Action: Architect will review each RFI, determine action required, and respond through the Web-based Project Management Software. Allow ten working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
 1. The following RFIs may be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, submit Change Order Request within 10 days of receipt of the RFI response as provided by General Conditions of the Contract. Contractor waives any right to make a claim by not initiating action within this 10-day duration of time.
 - E. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
 - F. RFI Log: Prepared and maintained by the Architect within the Web-based Project Management Software; Contractor to maintain a separate RFI log with subcontractors.
- 3.8 SUBMITTALS FOR REVIEW
- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
 5. Sustainable Design submittals and reports.
 - B. Package these submittals by specification section, except closeout submittals or Work performed by separate trades, in a single delivery to the Architect; failure of the Contractor to package these submittals in a single delivery may cause the Architect to withhold action on

submittal until associated submittals required by the particular specification section are received.

1. Sustainable Design Submittal and Report data required by the Contract Documents and the Sustainable Design certification process to be assembled separately from other submittal types and organized as the first items in any package of submittals; do not rely on the Architect or Sustainable Design consultant discovering the required data within product data or any other sort of submittal.
- C. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- D. Samples will be reviewed for aesthetic, color, or finish selection.
- E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.9 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Daily construction reports.
 8. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.11 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

- A. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. 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 21 days for initial review of each submittal; duration of time is defined by date received in Architect's office until the day sent from the Architect's office. 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 21 days for review of each resubmittal; duration of time is defined by date received in Architect's office until the day sent from the Architect's office.
 4. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal; duration of time is defined by date received in consultant's office until the day sent to the Contractor. Submittals required within the following divisions to be sent directly to the Architect's consultants:
 - a. All required submittals indicated in Division 3 section.
 - b. The following required submittals indicated in Division 4:
 - 1) Product data, shop drawings, material certificates, mix designs, and cold-weather procedures.
 - c. All required submittals indicated in the following Division 5 Sections:
 - 1) Structural Steel
 - 2) Steel Joists
 - 3) Steel Decking
 - 4) Cold-Formed Metal Framing
 - 5) Metal Stairs
 - 6) Railings and Handrails
 - 7) Metal Fabrications
 - d. All required submittals indicated in the following Division 8 Section:
 - 1) Door Hardware
 - 2) Curtainwall
 - e. All required submittals for Food Service Equipment.
 - f. All required submittals indicated in Mechanical Divisions 21 through 23 sections.
 - g. All required submittals indicated in Division 26 sections.
 - h. All required submittals indicated in Divisions 31 through 33 sections.
 5. Color Selection: Architect will select colors within 60 days (to allow time for presentation to Owner and for Owner comments) after all color samples have been submitted including, but not limited to items listed below. The submittal data shall be complete, including shop drawings, product data, and color samples, and all required submittals and materials shall be in compliance with the specifications and be subsequently approved by the Architect. Color samples shall be actual samples of the material and not photographs. If there is a variation in color, shade, texture, or pattern, submit multiple samples to show full range of variation.
 - a. Interior Items (including but not limited to):
 - 1) Plastic laminate, solid surface, and millwork.

- 2) Wood door veneer.
 - 3) Ceramic and porcelain tile.
 - 4) Resilient floor tile.
 - 5) Resilient wall base and accessories.
 - 6) Resinous flooring.
 - 7) Carpet and/or carpet tile.
 - 8) Acoustical wall and ceiling panels.
 - 9) Paint.
 - 10) High-performance coatings.
 - 11) Toilet compartments.
 - 12) Signs and cast letters.
 - 13) Casework veneer.
- b. Prefinished Exterior Items (including but not limited to):
- 1) Brick.
 - 2) Metal roofing.
 - 3) Metal wall panels.
 - 4) Copings, perimeter edge systems.
 - 5) Site furnishings and equipment.
- C. Submittal Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).
 - 2) Number and title of appropriate Specification Section.
 - 3) Drawing number and detail references, as appropriate.
 - 4) Location(s) where product is to be installed, as appropriate.
 - 5) Other necessary identification.
- D. Deviations: Encircle or otherwise specifically identify deviations from the Contract Documents on submittals.
- E. 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.
- F. Use for Construction: Use only final submittals with mark indicating "No Exceptions Taken" or "Note Markings" taken by Architect.
- 3.13 USE OF ARCHITECT'S AND ARCHITECT'S CONSULTANT'S DRAWING FILES REQUIRING RELEASE FORMS
- A. Copies of Architect's drawing files listed within required release forms will be provided to Contractor for Contractor's and Trade Contractor's use in connection with Project; Contractor must sign and return the release form at the end of this Section. As applicable, the Architect's

consultants may require their own releases to be signed and included with the executed Architect's form, and the Architect's consultant may charge a fee for releasing electronic files.

- B. Allow one week for processing and delivery after Architect receives the signed form.
- C. Only the files indicated on Agreement(s) included at end of this Section shall be made available for use as backgrounds for preparation of shop drawings, fabrication drawings, and coordination drawings. No other drawing files, for this Project, will be made available.
- D. Contractor does not have the right to release drawing files without first securing a signed Architect's release and, as applicable, the Architect's consultants' forms. Submit executed forms to the Architect by subsequent Application for Payment, with consultant fees as applicable.
- E. Any entity receiving the drawing files shall, to the fullest extent permitted by law, indemnify, defend and hold harmless the Architect, and its consultants from all claims, damages, losses, expenses, penalties and liabilities of any kind, including attorney's fees, arising out of or resulting from the use of the drawing files by the Contractor, or by third party recipients of the drawing files from the Contractor.
- F. Drawing files must not be considered to be Contract Documents as defined by the General Conditions of Contract.

3.14 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional licensed in the jurisdiction where project is located, 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.

3.15 CONTRACTOR'S REVIEW

- A. 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.
- B. Verify:
 - 1. Field Measurements.
 - 2. Field Construction Criteria.
 - 3. Catalog Numbers and Similar Data.
 - 4. Quantities.
- C. Contractor's responsibility regarding errors and omissions in submittals is not relieved by Architect's review of submittals.
- D. Contractor's responsibility regarding deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Architect gives written acceptance of specific deviations as approved by Owner.
- E. When work is directly related and involves more than one trade, coordinate submittal with other trades and submit under one cover.
- F. After a submittal has been submitted for review, no changes may be made to that Submittal other than changes resulting from review notes made by the Architect unless such changes are

clearly identified and circled before being resubmitted. Any failure to comply with this requirement shall nullify and invalidate the Architect's review.

- G. Approval Stamp: Stamp each submittal. 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 as indicated below:

THIS IS TO CERTIFY THAT THE SPECIFICATION REQUIREMENTS HAVE BEEN MET AND ALL DIMENSIONS, CONDITIONS, AND QUANTITIES ARE VERIFIED AS SHOWN AND/OR CORRECTED ON THESE DRAWINGS.
SIGNED _____

3.16 ARCHITECT'S/ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it; except where indicated otherwise. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. NO EXCEPTION TAKEN: The Work covered by the submittal is accepted as specified and the Work may proceed provided it complies with requirements of the Contract Documents.
 2. NOTE MARKINGS: The Work covered by the submittal is accepted as noted and the Work may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.
 3. REVISE AND RESUBMIT: Do not proceed with the Work covered by the submittal. Revise or prepare a new submittal according to the notations and requirements of the Contract Documents, and resubmit without delay. Unmarked items may be fabricated if indicated.
 4. REJECTED: Architect will list reasons for rejection on the submittal or in the transmittal letter accompanying the submittal. Do not proceed with the Work covered by the submittal. Prepare new submittal according to the notations and requirements of the Contract Documents, and resubmit without delay.
 5. ACTION NOT REQUIRED: Either the submittal was not requested or the submittal was for information only or for record purposes.
- C. 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.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 30 00

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ELECTRONIC MODEL

RELEASE FORM

Architect: Grimm + Parker Architects
8909 Westwood Center Dr.
Tysons, Virginia 22182

Contractor/CM: _____

Date: _____

Project No: G+P No. 21710.25

Software: Autodesk Revit
Version: 2021

File Name	Date Revised

Contractor/CM shall pay Architect a fee of (\$0)
Terms & Conditions:

1. Architect makes no representation as to the compatibility of the Building Information Model (BIM) with any hardware or software.
2. Since the information set forth in the BIM can be modified unintentionally or otherwise, the Architect reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.
3. All information in the BIM is considered instruments of service of the Architect and shall not be used for other projects, for additions to this project, or completion of this project by others. The BIM shall remain the property of the Architect, and in no case shall the transfer of these files be considered a sale.
4. Architect makes no representation regarding the accuracy, completeness, or permanence of the BIM, or for its merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated above may not have been incorporated. In the event of a conflict between the Architect's sealed contract drawings and the BIM files, the sealed contract drawings shall govern. It is the Contractor/CM's responsibility to determine if any conflicts exist. The BIM files shall not be considered to be Contract Documents as defined by the General Conditions of the Contract for Construction.
5. The use of BIM files prepared by the Architect shall not in any way obviate the Contractor/CM's responsibility of the proper checking and coordination of dimensions, details, member sizes and gauge, and quantities of materials as required to facilitate complete and accurate fabrication and erection.
6. Contractor does not have the right to release BIM files without first securing a signed Architect's release and, as applicable, the Architect's consultants' forms.
7. Any entity receiving the BIM shall, to the fullest extent permitted by law, indemnify, defend and hold harmless the Architect, and its subconsultants from all claims, damages, losses, expenses, penalties, and liabilities of any kind, including attorney's fees, arising out of or resulting from the use of the BIM files by the Contractor/CM, or by third party recipients of the BIM files from the Contractor/CM.

8. The Architect believes that no licensing or copyright fees are due to others on account of the transfer of the BIM files, but to the extent any are, the Contractor/CM will pay the appropriate fees and hold the Architect harmless from such claims.
9. Any purchase order number provided by the Contractor/CM is for Contractor/CM's accounting purposes only. Purchase order terms and conditions are void and are not a part of this agreement.
10. Payment of the service fee, if applicable, is due upon receipt of the BIM files.
11. This agreement shall be governed by the laws of the principal place of business of the Architect.
12. Any renderings produced from this BIM shall be able to be used by the Architect for promotional and marketing materials free of charge.

AUTHORIZED ACCEPTANCE

By Architect

By Contractor/CM

Signature

Signature

Print Name and Title

Print Name and Title

Date

Date



8. The Architect believes that no licensing or copyright fees are due to others on account of the transfer of the CAD Drawing files, but to the extent any are, the Contractor will pay the appropriate fees and hold the Architect harmless from such claims.
9. Any purchase order number provided by the Contractor is for Contractor's accounting purposes only. Purchase order terms and conditions are void and are not a part of this agreement.
10. This agreement shall be governed by the laws of the principal place of business of the Architect.

AUTHORIZED ACCEPTANCE

by Architect

Signature

Print Name and Title

Date



by Contractor

_____ *Signature*

_____ *Print Name and Title*

_____ *Date*

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SECTION 01 31 14 - FACILITY SERVICES COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Coordination documents.

1.2 SUBMITTALS

- A. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.
- B. Coordination Drawings and Schedules:
 - 1. Coordination drawings and schedules must be included in submittal schedule; refer to schedule requirements in Section 01 32 16, Construction Progress Schedule.
 - 2. Schedule submittals (product data, shop drawings, etc.) for work represented in Coordination Drawings, prior to completion of coordination drawings when possible.
 - 3. Coordination Drawings must be updated to accurately indicate products submitted after preparation of current Coordination Drawings.
 - 4. Architect's acceptance of submittals prior to completion of coordination drawings to be considered "As Noted" regardless of indication on record; Coordination Drawings must be completed before work without exception.
 - 5. Proceeding with work prior to completion of coordination drawings, including procurement of products or equipment, is at Contractor's risk.
 - 6. Contractor is solely responsible for additional costs to coordinate and fit work contrary or absent of coordination drawings.
 - 7. Refer to Divisions 21 through 28 for additional requirements.
- C. Areas of Work requiring Coordination Drawings include all areas and rooms in this building. Complete the requirements for Coordination Drawings within 75 days of starting construction operations. Prepare Coordination Drawings since limited space availability necessitates maximum utilization of space for efficient installation of different components.
 - 1. Content: Project-specific information, drawn accurately to scale.
 - 2. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. The Construction Documents in their original, copies or electronic file form are the Architect's instrument of service and are protected under copyright laws.
 - 3. Include the following information, as applicable:
 - a. Follow routing shown on Contract Drawings for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate required installation sequences.
 - d. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 4. Number of Copies: Submit digitally via the web-based project management software system.
 - a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.

5. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
6. Each trade shall sign and date the Coordination Drawings after the addition of their information.
7. Do not begin fabrication until receipt of completed Coordination Drawings are acknowledged by each contractor in writing to the Architect.
8. No progress payments will be made for any work affected by coordination drawings until coordination drawings governing that work have been accepted.
9. Any work installed prior to approval of coordination drawings shall be modified or replaced, as necessary, to conform to subsequently-approved construction drawings, at no additional cost to Owner.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 COORDINATION REQUIRED

- A. Coordinate the work listed below:
 1. Fire Suppression: Division 21.
 2. Plumbing: Division 22.
 3. Heating, Ventilating, and Air Conditioning: Division 23.
 4. Integrated Automation: Division 25.
 5. Electrical: Division 26.
 6. Communications: Division 27.
 7. Electronic Safety and Security: Division 28.
 8. Site Utilities: Division 33.
 9. Commissioning requirements throughout the Project Manual.
- B. Coordinate progress schedules, including dates for submittals and for delivery of products.
- C. Conduct meetings among subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- D. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.
- E. 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.
- F. 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.
- G. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
- H. Make adequate provisions to accommodate items scheduled for later installation.

3.2 COORDINATION DOCUMENTS

- A. Prepare coordination drawings to organize installation of products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.
 1. Priority of Construction Space:
 - a. Coordinate installation of different components to ensure performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
 - b. Following is the Order of Priority of construction space:

- 1) First: Ductwork.
 - 2) Second: Fire protection piping.
 - 3) Third: Other piping.
 - 4) Fourth: Conduit.
- B. Prepare a master schedule identifying responsibilities for activities that directly relate to this work, including submittals and temporary utilities; organize by specification section.
- C. Identify electrical power characteristics and control wiring required for each item of equipment.
- D. Maintain maximum headroom at all locations without finished ceilings.
- E. Maintain finished ceiling heights as indicated.
- F. Coordinate installations with other trades to prevent conflict with Work of other trades and cooperate in making reasonable modifications in layout as needed.
- G. Where conflicts occur with placement of mechanical and electrical materials as they relate to placement of other building materials, the Architect shall be consulted for assistance in coordination of the available space to accommodate all trades.
- H. Maintain documents for the duration of the work, recording changes due to site instructions, modifications or adjustments.
- I. Any construction delays required to accomplish coordination, approval of submittals or re-submittals, or consequent to coordination work, shall be incurred at no additional cost to Owner; such delays may include, but not be limited to , the following:
1. Time taken for preparation and submission of acceptable coordination drawings, including a reasonable period for Architect's review and approval.
 2. Time taken for preparation and approval of acceptable mock-ups.
 3. Time taken for modifications and replacements of non-conforming work.
- 3.3 COORDINATION OF SUBMITTALS
- A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.
- B. Check field dimensions and clearances and relationship to available space and anchors.
- C. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.
- D. Check motor voltages and control characteristics.
- E. Coordinate controls, interlocks, wiring of switches, and relays.
- F. Coordinate wiring and control diagrams.
- G. When changes in the work are made, review their effect on other work.
- H. Verify information and coordinate maintenance of record documents.
- 3.4 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS
- A. Review proposals and requests for substitution prior to submission to Architect.
- B. Verify compliance with Contract Documents and for compatibility with work of other sections.
- 3.5 ABOVE-CEILING PRE-CONSTRUCTION CONFERENCE
- A. Schedule and conduct with all affected parties present to review procedures for addressing potential conflicts, review of Coordination Drawings and obtain approval of each affected trade to ensure components, materials, and systems can be installed as intended prior to the Work being performed.
1. Identify Above-Ceiling Pre-Construction Conference on the Construction Schedule as a "milestone" date.

2. Advise the Architect of potential conflicts identified in the Coordination Drawings (if furnished) and Above-Ceiling Pre-Construction Conference.
 3. Do not proceed with construction or installation of the components, materials, and systems until potential conflicts identified have been resolved and affected parties have agreed to a remedy.
- B. Remedies to address conflicts not identified in the Coordination Drawings, Above-Ceiling Pre-Construction Conference, or otherwise addressed prior to construction or installation of the affected components, materials, and systems; or discovery of a non-workable situation without Coordination Drawings on file with the Owner will not be considered as a basis of delay, time extension, or additional cost to the Contract.
- 3.6 OBSERVATION OF WORK
- A. Observe work for compliance with Contract Documents.
 - B. Maintain a list of observed deficiencies and defects; promptly submit.
- 3.7 EQUIPMENT START-UP
- A. Verify utilities, connections, and controls are complete and equipment is in operable condition as required by Section 01 70 00.
 - B. Observe start-up and adjustments, test run, record time and date of start-up, and results.
 - C. Observe equipment demonstrations made to Owner; record times and additional information required for operation and maintenance manuals.
- 3.8 INSPECTION AND ACCEPTANCE OF EQUIPMENT
- A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.
 - B. Assist Architect with review. Prepare list of items to be completed and corrected.

END OF SECTION 01 31 14

SECTION 01 32 16 -CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

- A. Preliminary schedule.
- B. Construction progress schedule, with network analysis diagrams and reports.
- C. Responsibility for completion of Work per schedule and preparation of recovery schedules.

1.2 SUBMITTALS

- A. Within 15 days after date of Agreement of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.
- F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.
- G. Submit under transmittal letter form specified in Section 01 30 00 - Administrative Requirements.

1.3 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a preliminary network diagram.

3.2 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- C. Provide separate Submittal Schedule of submission dates for action and information submittals including, but not limited to, shop drawings, product data, samples, test and inspection reports, owner-furnished products identified under Allowances. Include dates reviewed submittals will be required from Architect, indicate decision dates for selection of finishes.

1. Submit within 45 days after award of contract.
 2. All submittals must be submitted within 60 days after award of contract.
 3. No work can be performed without accepted submittal of all submittals relevant to the work; Contractor bears the risk of ordering materials without accepted submittal of relevant action submittals.
 - a. In accordance with Section 01 30 00, the Architect has 60 days to select colors for components requiring color selection, after required submittals for all components requiring color selection are submitted; scheduling must account for this provision.
 - b. Contractor cannot request delay change in contract amount or completion, resulting from omission of this process within the construction progress schedule.
 4. Coordinate with construction schedule and schedule of values.
 5. Format schedule to allow tracking of status of submittals throughout duration of construction.
 6. Arrange information to include scheduled date for initial submission, specification number and title, description of item of work covered, and role and name of subcontractor.
 7. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make connections or revisions to initial submittals, and time for their review.
- D. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.
- E. Provide legend for symbols and abbreviations used.
- ### 3.3 NETWORK ANALYSIS
- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
1. Preceding and following event numbers.
 2. Activity description.
 3. Estimated duration of activity, in maximum 15 day intervals.
 4. Earliest start date.
 5. Earliest finish date.
 6. Actual start date.
 7. Actual finish date.
 8. Latest start date.
 9. Latest finish date.
 10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
 11. Monetary value of activity, keyed to Schedule of Values.
 12. Percentage of activity completed.
 13. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest.
 2. By amount of float, then in order of early start.

3.4 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.5 FLOAT TIME

- A. Float is not for the exclusive benefit of either Contractor or Owner.
- B. Manage work according to early start dates, by commencing activities on the early start date (calculated by the latest approved Contract Schedule) or earlier if possible, unless constrained by a bona fide resource limitation.
- C. Owner may reserve and apportion float time according to the needs of the Project.
- D. Actual or projected Owner-caused delays that do not exceed available float time shall not have any effect upon Contractor's adherence to specified time constraints and shall not be a basis for any time extension.
- E. Contractor acknowledges the following:
 - 1. Activity delays shall not automatically result in adjustment of specified time constraints.
 - 2. A Change Order or other Owner action or inaction may not affect existing critical activities or cause non-critical activities to become critical.
 - 3. A Change Order or delay may result in only absorbing a part of the available total float that may exist within an activity chain of the network, thereby not causing any effect on specified time constraints.
- F. Pursuant to the above float sharing requirements, use of float released by elimination of float suppression techniques such as preferential sequencing, special lead/lag logic restraints, unreasonably extended activity durations, or imposed dates shall be distributed by Owner to the benefit of Owner and Contractor.
- G. In the event of the Contractor wishes to complete the Work earlier than the time specified therefore:
 - 1. Continue to calculate float based on the Work completion date specified as of Contract execution, by maintaining the specified Work completion date as a "finish-no-later-than" constraint.
 - 2. The completion time for the Work shall be amended by Owner's acceptance of or acquiescence to Contractor's proposed earlier completion date.
 - 3. Contractor shall not, under any circumstances, receive additional compensation for indirect, general, administrative or other forms of overhead costs, for the period between the time of earlier completion proposed by Contractor and the completion time for the Work specified as of NTP.

3.6 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of

changes on schedules of separate contractors including the effects of changes on schedules of separate contractors.

3.7 RESPONSIBILITY FOR COMPLETION

- A. Take a combination of the following actions, at no additional cost to the Owner, when the progress schedule illustrates that the Contract Substantial Completion date cannot be met:
 - 1. Increase construction manpower in such quantities and trades to substantially eliminate the backlog of Work.
 - 2. Increase the number of work hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination to substantially eliminate the backlog of Work.
 - 3. Reschedule activities to achieve maximum practical concurrency of accomplishment of activities.
- B. Recovery Schedule: Prepare a recovery schedule from all trades to accelerate progress, if a milestone is missed, a single duration work activity is incomplete for ten workdays, or overall work progress is deemed insufficient by the Owner/Architect.
 - 1. A recovery schedule must be initiated by the Contractor, reviewed by effected trade contractors and submitted ten working days after one of the above conditions occurs.
 - 2. Submit recovery schedule in same number of copies as original.
 - 3. Trades must execute means necessary to bring the Project back on schedule using the recovery schedule; accelerated Work and additional overhead necessary to keep the Project on schedule is included in the Contract.
 - 4. Recovery schedule to be double the size of the original diagram, as a minimum, illustrating existing and revised activities alongside original data; revised activities must be easily differentiated from original schedule.
- C. Failure of the Contractor to comply with requirements of this subsection may be a basis for determination that the Contractor is not prosecuting the Work with such diligence as will ensure completion within the time stipulated; upon such determination, the Owner may take such action deemed appropriate.

3.8 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION 01 32 16

SECTION 01 35 53 - SECURITY PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Security measures including formal security program, entry control, personnel identification and miscellaneous restrictions.

1.2 SECURITY PROGRAM

- A. Protect Work , existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program at project mobilization.
- C. Maintain program throughout construction period until Owner occupancy.

1.3 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to Owner on request.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 35 53

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's construction-related professional design services.
- F. Contractor's design-related professional design services.
- G. Control of installation.
- H. Mock-ups.
- I. Tolerances.
- J. Manufacturers' field services.
- K. Defect Assessment.

1.2 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.
- G. IAS AC89 - Accreditation Criteria for Testing Laboratories.

1.3 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
 - b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

- C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.4 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - 1. Temporary sheeting, shoring, or supports.
 - 2. Temporary scaffolding.
 - 3. Temporary bracing.
 - 4. Temporary falsework for support of spanning or arched structures.
 - 5. Temporary stairs or steps required for construction access only.
 - 6. Temporary hoist(s) and rigging.
 - 7. Investigation of soil conditions to support construction equipment.

1.5 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
 - 1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work: Provide as indicated in Contract Documents including, but not limited to, assemblies indicated as Delegated Design.

1.6 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Schedule of Tests and Inspections: Prepare in tabular form, within [30 days] [60 days] following Preconstruction Conference, and include the following:
 - 1. Specification section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- D. Test Reports: Submit report to Architect and to Contractor within 15 days, after each test or inspection.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.

- f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit report in duplicate within 30 days of observation to Architect for information.
 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full-time registered Engineer and responsible officer.
 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the jurisdiction where project is located.
- C. Contractor's Quality Control (CQC) Plan:
1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
 - 1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
 - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - 1) Management and control of documents and records relating to quality.

- 2) Communications.
 - 3) Coordination procedures.
 - 4) Resource management.
 - 5) Process control.
 - 6) Inspection and testing procedures and scheduling.
 - 7) Control of noncomplying work.
 - 8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
 - 9) Control of testing and measuring equipment.
 - 10) Project materials certification.
 - 11) Managerial continuity and flexibility.
- c. Owner will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
- d. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.
- D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.8 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.9 TESTING AND INSPECTIONS AGENCIES AND SERVICES

- A. As indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform all specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093 and ASTM D3740.
 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 3. Laboratory: Authorized to operate in the jurisdiction where project is located.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.
- H. Contractor must develop a plan to monitor and control installation and protection of Work to ensure compliance with Sustainable Design requirements specified elsewhere and acoustical integrity, including but not limited to the following:
 - 1. Clear airspace with no bridging elements at structural isolation joints.
 - 2. Independence of steel stud framing and/or masonry at double/triple wall construction.
 - 3. Mass and airtightness of gypsum board assemblies.
 - 4. Solidity, mass, and airtightness of concrete and masonry construction.
 - 5. Grout fill at sound-rated/sound-control door and window frames.
 - 6. Mass of sound-control door leaves.
 - 7. Tolerances between sound-rated/sound-control doors, frames, thresholds, and perimeter seals.
 - 8. Proper compression and adjustment of perimeter seals at sound-rated/sound-control doors.
 - 9. Locations and quiet operation of door latching and closer hardware.
 - 10. Tolerances between window sashes, frames, and perimeter seals.
 - 11. Thicknesses of laminated glazing and airtightness of perimeter seals at sound-control windows
 - 12. Extent and coverage of sound-attenuation blankets above ceilings and in partitions.
 - 13. Shaping of wall and ceiling finishes.
 - 14. Extent, location, and thickness of sound-absorbing finishes.
 - 15. Extent, location, operation, and storage of adjustable sound-absorbing drapery.
 - 16. Extent and shaping of ceiling reflectors.
 - 17. Acoustical transparency of scrim materials.
 - 18. Rigid attachment of finish materials to substrates.
 - 19. Restrictions on routing of ductwork, piping, conduit, wiring, cable and sleeves.
 - 20. Resilient sealing of penetrations.
 - 21. Sheet caulking at electrical boxes within gypsum board assemblies.
 - 22. Flexible connections of plumbing, mechanical, electrical, and communications systems at equipment and structural isolation joints.
 - 23. Sound power/pressure level limits of mechanical equipment and air devices.
 - 24. Vibration isolation of conveying, plumbing, mechanical, electrical, and communications systems.
 - 25. Location and performance of duct sound attenuators.
 - 26. Internal duct lining in ductwork, plenums, and shafts.
 - 27. External lagging of ductwork and piping.

28. Locations of volume control dampers.
29. Location and orientation of transfer ducts.
30. Reports for testing, adjusting, and balancing of HVAC systems.
31. Silent operation of theatrical and architectural lighting.
32. Silent operation of fluorescent ballasts.
33. Silent operation of fire alarm system in standby mode.
34. Remote location of transformers and power supplies.

3.2 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- D. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- E. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- F. Accepted mock-ups shall be a comparison standard for the remaining Work.
- G. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

- A. Testing Agency Duties:
 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 2. Perform specified sampling and testing of products in accordance with specified standards.
 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 5. Perform additional tests and inspections required by Architect.
 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.5 MANUFACTURERS' FIELD SERVICES

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

3.6 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION 01 40 00

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Temporary telecommunications services.
- B. Temporary telephone service.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures and fencing.
- E. Security requirements.

1.2 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; 4G WiFi access point or faster.

1.3 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.4 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.5 FENCING

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

1.6 EXTERIOR ENCLOSURES

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

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 50 00

SECTION 01 51 00 - TEMPORARY UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Temporary Utilities: Electricity, lighting, heat, ventilation and water.

1.2 RELATED REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls: Telephone service for administrative purposes.

1.3 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.

1.4 TEMPORARY ELECTRICITY

- A. Provide power service required from utility source.
- B. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- C. Provide main service disconnect and over-current protection at convenient location and meter.
- D. Permanent convenience receptacles may be utilized during construction.
- E. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.5 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain LED, compact fluorescent or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.

1.6 TEMPORARY HEATING

- A. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- C. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.7 TEMPORARY COOLING

- A. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
- B. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

- C. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.8 TEMPORARY VENTILATION

- A. Existing ventilation equipment may not be used.

1.9 TEMPORARY WATER SERVICE

- A. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

1.10 USE OF EXISTING UTILITIES

- A. Contractor may use existing utilities without metering to perform the Work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 51 00

SECTION 01 52 13 - FIELD OFFICES AND SHEDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Temporary field offices for use of Contractor.
- B. Maintenance and removal.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove when no longer needed.
- C. Lighting for Offices: 50 fc at desk top height, exterior lighting at entrance doors.

2.3 ENVIRONMENTAL CONTROL

- A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.4 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For Contractor's needs and to provide space for project meetings.
- B. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.
- C. Other Furnishings: Contractor's option.
- D. Equipment: Six adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.2 INSTALLATION

- A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
- B. Parking: Two hard surfaced parking spaces for use by Owner and Architect, connected to office by hard surfaced walk.

3.3 MAINTENANCE AND CLEANING

- A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.
- B. Maintain approach walks free of mud, water, and snow.

3.4 REMOVAL

- A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION 01 52 13

SECTION 01 55 00 - VEHICULAR ACCESS AND PARKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Driveways, entrance and traffic routes.
- B. Parking.
- C. Existing pavements and parking areas.
- D. Permanent pavements and parking facilities.
- E. Construction parking controls.
- F. Haul routes.
- G. Traffic signs and signals.
- H. Maintenance.
- I. Removal, repair.
- J. Mud from site vehicles.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Temporary Construction: Contractor's option.
- B. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base and topping.

2.2 SIGNS, SIGNALS, AND DEVICES

- A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 58 13 - Temporary Project Signage.
- B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
- C. Flag Person Equipment: As required by local jurisdictions.

PART 3 - EXECUTION

3.1 DRIVEWAYS, ENTRANCE AND TRAFFIC ROUTES

- A. Keep driveways and entrances serving premises and site surrounding Project clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Provide continuous monitoring of site.
 - 1. Schedule deliveries to minimize use of driveways and entrances.
 - 2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Truck deliveries shall be scheduled so that the streets adjacent to the site do not back up with delivery trucks waiting to deliver materials. Trucks must be scheduled accordingly, or wait to unload inside the fence in the project site or off the Owner's property.

3.2 PARKING

- A. Use of existing parking facilities by construction personnel is not permitted.
- B. Use of new parking facilities by construction personnel is not permitted.

- C. Do not allow heavy vehicles or construction equipment in parking areas.
- D. Arrange for temporary parking areas to accommodate construction personnel.
- E. When site space is not adequate, provide additional off-site parking.
- F. Locate as approved by Architect.

3.3 PERMANENT PAVEMENTS AND PARKING FACILITIES

- A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
- B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.4 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
- B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.5 HAUL ROUTES

- A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.6 TRAFFIC SIGNS AND SIGNALS

- A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
- B. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
- C. Relocate as work progresses, to maintain effective traffic control.

3.7 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.8 REMOVAL, REPAIR

- A. Repair existing and new permanent facilities damaged by use, to original condition.
- B. Remove equipment and devices when no longer required.
- C. Repair damage caused by installation.

3.9 MUD FROM SITE VEHICLES

- A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION 01 55 00

SECTION 01 57 19 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 PROJECT GOALS

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

1.3 REFERENCE STANDARDS

- A. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology).
- B. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers.
- C. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
- D. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air.
- E. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction.

1.4 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.
- E. Ventilation: The process of supplying and removing air to and from interior spaces by natural or mechanical means.
- F. Volatile Organic Compound (VOC): Carbon compounds that participate in atmospheric photochemical reactions, (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate); the compounds vaporize (become a gas) at normal room temperatures.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
 - 1. Submit not less than 60 days before enclosure of building.
 - 2. Identify potential sources of odor and dust.
 - 3. Identify construction activities likely to produce odor or dust.
 - 4. Identify areas of project potentially affected, especially occupied areas.
 - 5. Evaluate potential problems by severity and describe methods of control.
 - 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - 7. Describe cleaning and dust control procedures.
 - 8. Describe coordination with commissioning procedures.
 - 9. Describe coordination with furniture delivery and placement within substantially completed areas.
 - 10. Document start of [air contaminant testing] [building flush-out] in construction progress schedule; identify location within construction progress schedule submission to demonstrate adequate planning and time for execution.
- C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- D. Duct and Terminal Unit Inspection Report.
- E. Air Contaminant Test Plan: Identify:
 - 1. Testing agency qualifications.
 - 2. Locations and scheduling of air sampling.
 - 3. Test procedures, in detail.
 - 4. Test instruments and apparatus.
 - 5. Sampling methods.
- F. Air Contaminant Test Reports: Show:
 - 1. Location where each sample was taken, and time.
 - 2. Test values for each air sample; average the values of each set of 3.
 - 3. HVAC operating conditions.
 - 4. Certification of test equipment calibration.
 - 5. Other conditions or discrepancies that might have influenced results.

1.6 SCHEDULING

- A. Coordinate construction activities to minimize or eliminate disruption of operations in occupied portions of building.
- B. Schedule for storage, installation, and protection of all components of air distribution systems.
- C. Schedule for storage, installation, and protect of absorptive materials (woven, fibrous or porous in nature, such as carpet, ceiling tiles, insulation, and fabrics) from exposure to emissions during and after installation from materials and finishes with potential for short-term release of off-gassing volatile organic compounds.
 - 1. Highlight critical methods used to protect absorptive materials from airborne pollutants such as: dust, debris, moisture, gaseous and microbial contamination.
 - 2. Sequence installation of absorptive materials after odor-emitting activities have occurred and have been mitigated by ventilation.
- D. Do not store absorptive materials on-site if protection measures as described above cannot be ensured.

- E. Avoid building occupancy while construction related pollutants are present.
- F. Ensure proper and complete curing of concrete before covering.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Auxiliary Air Filters:
 - 1. MERV of 8, minimum, when tested in accordance with ASHRAE 52.2, during construction.
 - 2. MERV of 13, minimum, when tested in accordance with ASHRAE 52.2, installed prior to occupancy.

PART 3 - EXECUTION

3.1 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.
- C. HVAC system shall be kept clean, free of dust, debris, moisture, gaseous and microbial contamination during storage, handling, installation and punch-out. Inspect all air inlets, air outlets, grilles, diffusers, plenums, and ducts upon completion of Work.
 - 1. Cover and protect (taped plastic or similar method) all exposed air inlet and outlet openings, grilles, ducts, plenums, to prevent water, moisture, dust and other contaminate intrusion.
 - 2. Apply protection immediately after installation of equipment and ducting.
 - 3. Ducting runs that require more than a single day to install shall be protected at end of each day's Work.
 - 4. Leaks in return ducts and air handlers shall be checked and repaired.
 - 5. Inspect filtration monthly and replace as needed with new media throughout the HVAC system; filtration media shall be minimum MERV 8.
 - 6. After final phase of construction, install new filtration media throughout the HVAC system; filtration media shall be minimum MERV 8.
 - 7. Cleaning of ductwork is not part of this contract; however Contractor shall bear cost of cleaning required by Owner due to failure of Contractor to protect ducts and equipment from construction pollutants as specified.
- D. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
 - 1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
 - 2. Exhaust directly to outside.
 - 3. Seal HVAC air inlets and outlets immediately after duct installation.
- E. Do not store construction materials or waste in mechanical or electrical rooms.
- F. Provide direct exhaust to the exterior during installation of strong emitting materials, including touch-up activities; keep exhaust away from intakes and occupied spaces.
- G. Provide adequate ventilation of packaged dry products prior to installations. Remove from package and place in a secure, dry, well-ventilated space, free from contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degree maximum

continuously during ventilations period. Do not ventilate within limits of Work unless otherwise approved by Architect.

- H. "Bake-out" or "super-heating" of spaces to accelerate the release of gaseous emissions is not permitted.
- I. Prohibit smoking and use of fossil-fueled temporary heating units inside the building and near building entrances, windows and intakes and within 25 feet of building entrances.
- J. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
 - 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 - 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 - 3. Clean tops of doors and frames.
 - 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 - 5. Clean return plenums of air handling units.
 - 6. Remove intake filters last, after cleaning is complete.
- K. Use low-toxic pest control chemicals such as boron, if needed, unless otherwise directed.
- L. Remove spills or excess application of solvent-containing products as soon as possible. Use low-emitting cleaning agents, giving preference to Green Seal products.
- M. Keep work areas as dry as possible; replace any absorptive (dry sink) material that is exposed to moisture.
- N. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.2 PATHWAY INTERRUPTION

- A. Provide negative pressurization of spaces under construction and/or demolition and positive pressurization of occupied or finished spaces while construction work proceeds in adjacent areas.
- B. Relocate pollutant sources when project equipment or staging areas coincide with critical air flow pathways and place plastic barriers to contain construction areas.
- C. Temporarily seal building, including air intakes and exhaust vents, and any other building openings, when dust-generating or strong-emitting construction products or procedures are used on the exterior of the building.
- D. Once spaces within building become occupied, work areas must remain under negative pressure. Exhaust air at a rate at least 10% greater than the rate of supply. Do not exhaust air where it can be drawn back into occupied spaces and place a continuous plastic barriers creating a seal between construction areas and occupied spaces.

3.3 INDOOR AIR QUALITY MANAGEMENT - PRIOR TO OCCUPANCY

- A. Provide Air Contaminant Testing, if testing fails, provide Building Flush-Out.

3.4 BUILDING FLUSH-OUT

- A. Perform building flush-out before occupancy, with all interior finishes installed and new filtration media in place.
- B. Do not start flush-out until:
 - 1. All construction is complete.
 - 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 - 3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
 - 4. New HVAC filtration media have been installed.

- C. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
 - 1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.
 - 2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
 - 3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
 - 4. Space may be occupied following delivery of a minimum of 3,500 cubic feet of outside air per square feet of floor area to space, until the total of 14,000 cubic feet per square foot of outside air has been delivered to the space, and:
 - a. Begin ventilation at least three hours prior to daily occupancy.
 - b. Continue ventilation during all occupied periods.
 - c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.
 - 5. Do not start flush-out in any area until:
 - a. All construction is complete.
 - b. HVAC systems have been tested, adjusted, and balanced for proper operation.
 - c. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
 - d. New HVAC filtration media have been installed.
- D. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.5 AIR CONTAMINANT TESTING

- A. Perform air contaminant testing before occupancy.
- B. Do not start air contaminant testing until:
 - 1. All construction is complete, including interior finishes.
 - 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 - 3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.
 - 4. New HVAC filtration media have been installed.
- C. Indoor Air Samples: Collect from spaces representative of occupied areas:
 - 1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
 - 2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet; take samples from areas having the least ventilation and those having the greatest presumed source strength.
 - 3. Collect samples from height from 36 inches to 72 inches above floor.
 - 4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
 - 5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
 - 6. For each sampling point where maximum concentration limits are exceeded conduct flush-out with outside air and retest the specific parameter(s) that were exceeded to indicate the requirements are achieved; repeat procedure until all requirements have been met.
 - 7. When retesting the same building areas, take samples from at least the same locations as in first test.
- D. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

- E. Analyze air samples and submit report.
- F. Air Contaminant Concentration Limits:
 - 1. Formaldehyde: Not more than 27 parts per billion.
 - 2. PM10 Particulates: Not more than 50 micrograms per cubic meter.
 - 3. Total Volatile Organic Compounds (TVOCs): Not more than 500 micrograms per cubic meter.
 - 4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: Allowable concentrations listed in Table 4-1.
 - 5. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.
- G. Air Contaminant Concentration Test Methods:
 - 1. Formaldehyde: ASTM D5197, EPA 625/R-96/010b Method TO-11A, or EPA 600/4-90/010 Method IP-6.
 - 2. Particulates: EPA 600/4-90/010 Method IP-10.
 - 3. Total Volatile Organic Compounds (TVOC): EPA 625/R-96/010b Method TO-1, TO-15, or TO-17; or EPA 600/4-90/010 Method IP-1.
 - 4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: ASTM D5197, or EPA 625/R-96/010b Method TO-1, TO-15, or TO-17.
 - 5. Carbon Monoxide: EPA 600/4-90/010 Method IP-3, plus measure outdoor air; measure in ppm; report both indoor and outdoor measurements.

END OF SECTION 01 57 19

SECTION 01 58 13 - TEMPORARY PROJECT SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Project identification sign.
- B. Project informational signs.

1.2 QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 miles/hr wind velocity.
- B. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 - PRODUCTS

2.1 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.
- C. Rough Hardware: Galvanized.
- D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
- E. Lettering: Exterior quality paint, contrasting colors.

2.2 PROJECT IDENTIFICATION SIGN

- A. One painted sign, 48 sq ft area, bottom 6 feet above ground.
- B. Graphic Design, Colors, Style of Lettering: Designated by Architect.

2.3 PROJECT INFORMATIONAL SIGNS

- A. Provide signs designation construction access at entrances designated for construction access.
- B. Provide no trespassing and hard hat area signs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Erect at designated location.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.

3.2 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.3 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION 01 58 13

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 45 days after award of contract.
 - 2. For products specified only by reference standards, list applicable reference standards.
 - 3. Failure to comply with submission date will obligate Contractor to providing Basis-of-Design products where named in the specification, in order to allow associated trades to determine their coordination issues.
- B. Comparable Product Request Submittal: Submit request for consideration of each comparable product or system for evaluation by Architect in accordance with submittal procedures specified in this Section for Substitution Requests.
 - 1. Submit Comparable Product requests within 45 days after award of contract.
- C. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- F. Sustainable Design Submittals: Refer to Division 1, Sustainable Design Requirements.

PART 2 - PRODUCTS

2.1 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.2 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Division 1 - Sustainable Design Requirements.
 - 2. If wet-applied, have lower VOC content, as defined in Division 1 - Sustainable Design Requirements.
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 4. Have longer documented life span under normal use.
 - 5. Result in less construction waste. See Section 01 74 19.
 - 6. Are made of vegetable materials that are rapidly renewable.
- C. Sustainably Harvested Wood:
 - 1. Definition: Wood-based materials include but are not limited to structural framing, dimension lumber, flooring, wood doors, finishes, and furnishings that are permanently installed in the project. Wood and wood-based products not permanently installed in the project are not included in the definition.
 - 2. Overall Project Requirement: Provide a minimum of 50 percent of all wood-based materials made of sustainably harvested wood.
 - 3. Specific Wood-Based Fabrications: Fabricate of sustainably harvested wood when so specified elsewhere.
 - 4. Certification: Provide wood certified or labeled by an organization accredited by one of the following:
 - a. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit <http://www.fscCanada.org>, for the USA visit <http://www.fscus.org>.
- D. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- E. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

2.3 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products of Named Manufacturers: Contractor to provide products from named manufacturers; refer to other provisions regarding substitutions.
- C. Named Products: Products identified by manufacturer, make or model number or other designation shown or listed in manufacturer's published product literature.
- D. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other

designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1. Where other named manufacturers included acceptable product for performance, Contractor must coordinate modifications due to sizing or engineering differences with associated trade contractors.
- E. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product. Comparable Products include:
1. Product of manufacturer listed without identified product; either with or without Basis-of-Design product identified in the Section.
 2. Product of manufacturer other than manufacturer/product listed and followed with "or equal," "or approved equal," or similar phrase.
 3. Contractor is responsible for costs associated with the use of Comparable Products, including coordination and modification with other trade contractors related to selection of Comparable Product.
 4. Use of Comparable Product must not require changes to the building design or engineering; use must not require additional inspection or testing fees to be paid by the Owner.
- F. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

2.4 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 - EXECUTION

3.1 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.2 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.3 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- J. Prevent contact with material that may cause corrosion, discoloration, or staining.
- K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 60 00

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.

1.2 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
 - 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Alternatives to cutting and patching.
 - f. Effect on work of Owner or separate Contractor.
 - g. Written permission of affected separate Contractor.
 - h. Date and time work will be executed.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.3 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the jurisdiction where project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities.
- B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the jurisdiction where project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical

control points necessary for laying out construction work on project of similar size, scope and/or complexity.

1.4 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- E. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- F. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 25 00 - Substitution Procedures.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
 - 3. Review conflicts and compatibility issues.
 - 4. Review environmental limitations and protection.
 - 5. Examine substrates.
 - 6. Review requirements of the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Submittals.
 - e. Mockups.
 - f. Testing and inspection.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

3.5 GENERAL INSTALLATION REQUIREMENTS

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

3.6 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- C. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- K. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

- L. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.7 PROGRESS CLEANING

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

3.8 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.9 SYSTEM STARTUP

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

3.10 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

- A. 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.
- B. Use cleaning materials that are nonhazardous.

- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- E. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- F. 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.
- G. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- H. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- I. Remove tools, construction equipment, machinery, and surplus material from Project site.
- J. Remove snow and ice to provide safe access to building.
- K. 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.
- L. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- M. Sweep concrete floors broom clean in unoccupied spaces.
- N. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- O. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- P. Remove labels that are not permanent.
- Q. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
- R. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- S. Replace parts subject to unusual operating conditions.
- T. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- U. Clean exposed surfaces of diffusers, registers, and grills.
- V. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- W. Leave Project clean and ready for occupancy.

END OF SECTION 01 70 00

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Sustainable Design Report: Refer to Division 1 Sustainable Design Requirements for waste disposal reporting requirements.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 - 5. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
 - 6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- C. Final Waste Management Documentation: Submit at completion of Substantial Completion and prior to contract closeout:
 - 1. All information required in Monthly Report Submittals.
 - 2. Legible copies of on-site logs, manifests, weight tickets, and receipts.
 - 3. Final Report for Sustainable Design: Refer to Division 1 Sustainable Design Requirements for documentation required for waste management.

PART 2 - PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

- A. See Section 01 25 00 - Substitution Procedures for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 25 00 - Substitution Procedures:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Records: Maintain onsite logs for each load of materials removed from site:
 - 1. Landfill Log: Include type of material, load (by weight or volume), recycling/hauling service, date accepted by landfill, and facility fee.
 - 2. Waste Diversion: Include type of material, load (by weight or volume), recycling/hauling service, date accepted by recycling service, or non-profit receiver and facility fee.
 - 3. Where comingling occurs prior to collection, track the amount of construction waste diverted from landfill based on the weight or volume of the removed co-mingled waste and provide the documentation of percentages of recycled from the sorting facility.
- F. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.

3. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 4. Locate enclosures out of the way of construction traffic.
 5. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 6. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
 7. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
 8. Provide bi-lingual signage.
- G. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- H. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
1. Coordinate work of recycling, composting and salvaging waste haulers with other trades.
 2. Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- I. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- J. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 74 19

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 1. Inspection procedures.

1.2 RELATED REQUIREMENTS

- A. Section 01 20 00 - Payment Procedures.

1.3 SUBSTANTIAL COMPLETION

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

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Price and Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- 1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)
- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use form reviewed and accepted by Owner and Architect.
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.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 77 00

SECTION 01 78 00 - CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Record Drawings: Comply with the following:
- C. Number of Copies: Submit copies of record Drawings as follows:
 - 1. Initial Submittal:
 - a. Submit record digital data files and one set of plots.
 - 2. Final Submittal:
 - a. Submit record digital data files and three set(s) of record digital data file plots.
- D. Record Specifications: Submit searchable, annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- E. Record Product Data: Submit searchable, annotated PDF electronic files of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.
- F. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit searchable, annotated PDF electronic files and directories of each submittal.
- G. Certification: With each application for payment, provide written certification that Project Record Documents are current at time application is submitted.
- H. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.
- I. Operation and Maintenance Data:
 - 1. Manual Content Submittal: 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.
 - a. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - b. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
 - 2. Manual Format: Submit operations and maintenance manuals in the following format:
 - a. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit through Newforma.

- 1) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - a) 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.
 - b) 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.
 - 2) Enable inserted reviewer comments on draft submittals.
 - b. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
 3. Initial Manual Submittal: Submit draft copy of each manual at least 90 days calendar days before commencing demonstration and training. Architect or Owner will comment on whether general scope and content of manual are acceptable within 60 calendar days before commencing demonstration and training.
 4. Final Draft Manual Submittal: Submit revised draft copy of each manual that was found unacceptable by Architect or Owner at least 30 calendar days before commencing demonstration and training. Architect or Owner will comment or approve within 15 calendar days before commencing demonstration and training.
- J. Warranties and Bonds:
1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
 4. Format: Submit record Specifications as searchable, annotated PDF electronic file.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction.
1. Record Prints:
 - a. 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.
 - 1) Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - 2) Accurately record information in an understandable drawing technique.
 - 3) Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 4) Cross-reference record prints to corresponding archive photographic documentation.
 - b. Content: Types of items requiring marking include, but are not limited to, the following:
 - 1) Dimensional changes to Drawings.
 - 2) Revisions to details shown on Drawings.
 - 3) Depths of foundations below first floor.
 - 4) Locations and depths of underground utilities referenced to permanent surface improvements.
 - 5) Revisions to routing of piping and conduits.
 - 6) Revisions to electrical circuitry.
 - 7) Actual equipment locations.
 - 8) Duct size and routing.
 - 9) Locations of concealed internal utilities referenced to visible and accessible features of the structure.
 - 10) Changes made by addendum.
 - 11) Changes made by Change Order or Construction Change Directive.
 - 12) Changes made following Architect's written orders.
 - 13) Details not on the original Contract Drawings.
 - 14) Field records for variable and concealed conditions.
 - 15) Record information on the Work that is shown only schematically.
 - c. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - d. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - e. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - f. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
 2. Record Digital File: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of digital data files of the Contract Drawings, as follows:
 - a. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 - b. Format: Annotated PDF electronic file annotated text, optical character recognition (OCR) searchable, PDF electronic files with comment function enabled.

- c. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
 - d. Refer instances of uncertainty to Architect for resolution.
 3. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
 - a. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 - b. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
 4. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - a. 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.
 - b. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - c. Identification: As follows:
 - 1) Project name.
 - 2) Date.
 - 3) Designation "PROJECT RECORD DRAWINGS."
 - 4) Name of Architect.
 - 5) Name of Contractor.
- G. Product Record Data: 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. If possible, a Change Order proposal should include resubmitting updated Product Data. This eliminates the need to mark up the previous submittal.
 4. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
 5. Format: Submit record Product Data as searchable, annotated PDF electronic file.
 - a. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.
- H. Miscellaneous Record Submittals:
 1. 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.
 2. Format: Submit miscellaneous record submittals as PDF electronic file.
 - a. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

3.2 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

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

3.3 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.4 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.5 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- I. Provide control diagrams by controls manufacturer as installed.
- J. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- K. Lamp Submittal: Include data on all lamps labeled according to fixture type; this data shall include:
 - 1. Manufacturer.
 - 2. Lamp designation (ex. PAR38, M16, T5HO).
 - 3. Manufacturer's catalog number.
 - 4. Wattage.
 - 5. Color temperature.
 - 6. CRI.
 - 7. Beam spread.
 - 8. Initial lumens.
 - 9. Catalog spec sheet for each fixture type.
- L. Additional Requirements: As specified in individual product specification sections.

3.6 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- D. Prepare data in the form of an instructional manual.
- E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.

- c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.
- K. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- L. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume. Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
- M. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- N. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- O. 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.
 2. Performance and design criteria if Contractor is 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.
- P. 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.

- Q. 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.
- R. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- S. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

3.7 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Section format to follow that of the Project Manual(s). 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.

3.8 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- 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 printed 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.

3.9 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. **General:**
 - 1. Execute and provide notarized Project Warranty on form furnished by Owner.
 - 2. Provide special written warranties or guarantees or both for products, equipment, systems, and installations required by other sections of Contract Documents for duration indicated.
 - 3. Provide manufacturer's warranties or guarantees or both for products, equipment, systems, and installations required by other sections of Contract Documents for duration indicated.
 - 4. Where manufacturer's warranties or guarantees, or both expire before duration required by other sections of Contract Documents, obtain and pay for extensions as a part of Contract Price.
 - 5. Provide all warranties or guarantees or both prior to Final Payment.

6. Warranties or guarantees or both required by Contract Documents shall commence on date of Substantial Completion of work, or designated portion thereof, unless otherwise indicated in Certificate of Substantial Completion.
 - C. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - D. Include procedures to follow to ensure Warranties are not voided due to maintenance and operational activities,
 - E. Include procedures required to initiate warranty claims.
 - F. Provide special written warranties, manufacturer's warranties, and/or guarantees for products, equipment, systems, and installation which are required by other sections of Contract Documents for the duration indicated.
 - G. Warranties and guarantees shall commence on the date of Substantial Completion of work, or designated portion of work thereof, unless otherwise indicated in Certificate of Substantial Completion.
 - H. If Contractor cannot warrant and/or guarantee any portion of work using products or construction methods indicated in the Contract Documents, notify Architect and Owner in writing during bid period and before contracts are awarded.
 1. Indicate product or work name(s) and the reasoning to support claim.
 2. Provide names of products, method, and/or data on which substitutions can be warranted and/or guaranteed.
 3. Should Contractor fail to notify Architect, Contractor will be considered as having agreed to warrant and/or guarantee the work indicated.
 - I. Provide a fully executed and notarized Project Warranty. Owner Standard Document shall be provided.

END OF SECTION 01 78 00

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections; comply with Division 1 - Sustainable Design Requirements.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Security and audio visual systems.
 - 6. Conveying systems.
 - 7. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.2 SUBMITTALS

- A. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
 - 1. Format: DVD Disc.
 - 2. Label each disc and container with session identification and date.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.
- F. Coordinate demonstration and training requirements with commissioning requirements.

END OF SECTION 01 79 00

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

1.2 DEFINITIONS

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

1.3 MATERIALS OWNERSHIP

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

1.4 PREINSTALLATION MEETINGS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection and for dust control. Indicate proposed locations and construction of barriers.
- D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 01 30 00 "Administrative Requirements." Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.
- 1.6 CLOSEOUT SUBMITTALS
- A. Inventory: Submit a list of items that have been removed and salvaged.
- 1.7 QUALITY ASSURANCE
- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- 1.8 FIELD CONDITIONS
- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.
 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.
- 1.9 WARRANTY
- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Comply with requirements specified in Section 01 30 00 "Administrative Requirements."
 - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

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

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain fire watch during and for duration of hours required by OSHA or AHJ after flame-cutting operations.
 - 6. Maintain adequate ventilation when using cutting torches.
 - 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 10. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19 "Construction Waste Management and Disposal."

- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 07 54 23 for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 "Construction Waste Management and Disposal."
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION 02 41 19

SECTION 02 80 00 - HAZARDOUS MATERIAL SURVEY AND ABATEMENT

PART 1 - GENERAL

1.1 GENERAL

- A. This information is included in the Project Manual for bidders' information, it is not part of the Contract Documents, and does not relieve the bidders from doing their own investigation to determine the accuracy of the information.

1.2 ABATEMENT OF HAZARDOUS MATERIALS

- A. Contractor is to abate all hazardous materials identified in the report in compliance with 29 CFR 1926 and state and local regulations.
- B. Removal shall be performed by an abatement contractor, licensed in the jurisdiction where the project is located, prior to demolition activities under supervision by an accredited third-party monitor.

1.3 STATEMENT CONCERNING THE SURVEY

- A. The reports and samples of hazardous materials encountered were obtained by the Owner.
- B. The hazardous material samples and analysis were performed by Marine Chemist Service, Inc., in accordance with their system of analysis and sampling and they, Marine Chemist Service, Inc., neither the Owner, the Architect, or his consultants guarantee the accuracy or consistency of the information contained within the Hazardous Material Survey with the actual site conditions.
- C. Any radical deviation from the anticipated material, as indicated by the reports, during demolition Work should be reported to the Owner immediately and confirmed in writing.

1.4 CONFIRMATION OF HAZARDOUS MATERIAL CONTAINING MATERIALS

- A. Bidders, Contractors, and any others who are concerned with, or are affected by the test results should make their own tests at the site at their own expense. Coordinate with the Owner.
- B. No additional compensations will be allowed the Contractor for failure to fully investigate the site for materials indicated in the reports or for the neglect of the information contained in the reports.

1.5 ATTACHMENT

- A. Hazardous Materials Report dated April 21, 2021.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 02 80 00

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Marine Chemist Service, Inc.

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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

April 15, 2021

Newport News Public Schools
12580 Patrick Henry Drive
Newport News, Virginia 23606

Attention: Pennie Boyack

Reference: (1st and 2nd Floor)
Gatewood Peep / Warwick Senior Center
Newport News, Virginia
MCS Job #21-022S

Dear Mrs. Boyack:

Please find enclosed the Asbestos Inspection Report including Lab Analyses for the above referenced job site.

If you have any questions, please do not hesitate to contact us.

Sincerely,

Ryan Stanley
Virginia Asbestos Inspector
License #3303 004642

**PARTIAL ASBESTOS INSPECTION REPORT
OF
GATEWOOD PEEP / WARWICK SENIOR CENTER
NEWPORT NEWS, VIRGINIA
(1st AND 2nd FLOOR)
MCS JOB #21-022S**



Marine Chemist Service, Inc.

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Marine Chemist Service, Inc.

Partial Asbestos Inspection Report

of

**Gatewood Peep / Warwick Senior Center
Newport News, Virginia
(1st and 2nd Floor)**

on

February 22nd and March 6th of 2021

Prepared For:

**Pennie Boyack
Newport News Public Schools
12580 Patrick Henry Boulevard
Newport News, Virginia, 23606
MCS Job #21-022S**

By

**Ryan Stanley
Virginia Asbestos Inspector License #3303 004642
Marine Chemist Service, Inc.
11850 Tug Boat Lane
Newport News, Virginia 23606
(757) 873-0933**

April 15, 2021

Date



Inspector Signature

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Marine Chemist Service, Inc.

SECTION 1

Partial Asbestos Inspection Report

**PARTIAL ASBESTOS INSPECTION OF GATEWOOD PEEP / WARWICK SENIOR CENTER
NEWPORT NEWS, VIRGINIA
(1ST AND 2ND FLOOR)**

INTRODUCTION

Background and Purpose

There has been a growing public awareness of the link between the inhalation of asbestos fibers and various diseases such as asbestosis, mesothelioma, lung, and other cancers. As a result, the Asbestos Hazard Emergency Response Act (AHERA 40 CFR Part 763) for schools grades K through 12 was established by EPA.

The necessary components of an AHERA inspection require the accredited inspector to visually inspect and assess the condition of all known or assumed friable asbestos containing building materials (ACBM); to visually inspect non - friable ACBM and touch it to determine friability, and to identify homogeneous areas of friable materials.

EPA's National Emission Standards for Hazardous Air Pollutants (NESHAPS) require thorough inspections for asbestos in structures before the renovation or demolition of those structures.

Virginia law requires that if the initial building permit was issued prior to January 1, 1985, an asbestos inspection must be performed prior to the local authorities issuing a building permit.

In order to comply with NESHAPS, buildings to be renovated or demolished must be thoroughly inspected for asbestos containing building materials. Marine Chemist Service, Inc. follows the AHERA sampling protocol for interior surveys and the Virginia standard for roof surveys.

The purpose of this survey was to provide information for this property concerning the location and type of accessible and/or visible asbestos containing materials prior to renovation.

In compliance with Virginia Regulations, Marine Chemist Service Inc. performed asbestos sampling and a partial asbestos inspection of the First and Second Floor at Gatewood Peep / Warwick Senior Center, located in Newport News, Virginia on February 22nd and March 6th of 2021.

General Information

Marine Chemist Service, Inc. was hired by Pennie Boyack, on February 22, 2021 to conduct asbestos bulk sampling for suspect asbestos-containing building materials at Gatewood Peep / Warwick Senior Center, located in Newport News, Virginia.

Authorization

Authorization to perform this testing was provided in the form of a phone call notice to proceed by Pennie Boyack on January 4, 2021. The building was occupied at the time of the inspection.

Warranty

This visual inspection and laboratory report has been prepared in accordance with AHERA and Virginia requirements and current accepted professional practices. A minimum number of bulk asbestos samples were collected to determine the presence or absence of asbestos. This inspection has been performed to provide the client with information concerning the presence of accessible and/or exposed suspect asbestos containing building materials. Destructive testing was performed during the inspection. This inspection documents conditions at the time of the inspection only. No other warranties are implied or expressed.

SURVEY METHODS

Inspection Methods

The asbestos survey was performed by a Virginia licensed asbestos inspector. A visual walk through inspection was performed to identify suspect asbestos containing materials and homogeneous areas.

Sampling Methods

The Virginia licensed asbestos inspector sampled the identified suspect materials within the homogeneous areas following the visual inspection. Sampling was not performed on any inaccessible materials and did not involve destructive testing of building components. Sample locations were selected randomly.

LABORATORY METHODS

Analysis Methods

The bulk sample was first visually observed and described. The sample was mounted onto a slide, covered with dispersion staining oil and a cover slip, and observed under a polarized light microscope (PLM). The asbestos and non-asbestos materials in the sample are identified by this method.

The PLM microscopist estimates the amounts of asbestos and non-asbestos components by determining visually the relative volume of each to the total volume of the sample.

ASBESTOS INSPECTION

Document Review and On-Site Survey

Blueprints were provided for the inspection and a sketch was made upon which sample/asbestos material locations were marked.

Identification of Suspect Asbestos Containing Materials

A visual inspection was performed on the suspect asbestos containing materials found in the surveyed areas. The suspect asbestos containing materials are as follows:

1. 12” Floor Tile / Adhesive
2. Carpet / Adhesive
3. Stair Tread / Adhesive
4. Brick and Mortar
5. 6” Base Cove / Adhesive
6. 4” Base Cove / Adhesive
7. Drywall
8. Block / Wall Sealer / Paint
9. Door Caulk
10. Window Caulk
11. Window Glaze
12. 2’ x 4’ Ceiling Tile
13. 2’ x 2’ Ceiling Tile
14. Duct Insulation
15. Sink Undercoating
16. Pipe Insulation
17. Cementitious Material
18. Heater Insulation
19. 9” Ceiling Tile
20. Ceramic Wall Tile
21. 9” Tile/ Mastic
22. Terrazzo
23. 12” Ceiling Tile

Bulk Sampling

Bulk sampling was performed on all suspect asbestos-containing materials found in the areas and the minimum number of samples were taken as required in the AHERA Standards.

Bulk samples were taken penetrating all layers of the material. The samples were at least one cubic centimeter and were placed in a sealed container at the time of collection. All precautions were taken to prevent exposure to those present in or around the facility during the collection of samples. All sampling locations were patched with an encapsulant after the sampling was complete.

Samples listed below are grouped into homogeneous areas. Homogeneous areas are areas, which are uniform by color, texture, construction/application date, and general appearance.

Some sample results in the % asbestos column may be displayed in this report with a slash between two numbers, (#/#). The first number represents the first material listed under the material location/description and the second number represents the second material listed.

When N/A is placed in the friable category it means the sample tested negative - (0) or less than one percent - ($\leq 1\%$) for asbestos and the friable description does not apply.

Samples were analyzed utilizing Polarized Light Microscopy (PLM) with dispersion staining by a NVLAP accredited laboratory (Marine Chemist Service, Inc. NVLAP Lab Code 200628-0). The results are in section 6.

SECTION 2

Sample Summary Table



**Gatewood Peep / Warwick Senior Center
Newport News, Virginia
(Interior)**

Sample #	Lab Sample #	Material Location and Description	% Asbestos	Friable Y/N
WSC-1	0132244-001	Men's Restroom, 12" Pinkish-Brown with Dark Speckles, Floor Tile / Mastic	0/0	N/A
WSC-2	0132244-002	Women's Restroom, 12" Pinkish-Brown with Dark Speckles, Floor Tile / Mastic	0/10	N
WSC-3	0132244-003	Hallway, 12" Pinkish-Brown with Dark Speckles, Floor Tile / Mastic	0/0	N/A
WSC-4	0132244-004	Women's Restroom, 12" Tan with Dark Brown Speckles, Floor Tile / Mastic	2/10	N
WSC-5	0132244-005	408, 12" Tan with Dark Brown Speckles, Floor Tile / Mastic	3/10	N
WSC-6	0132244-006	400A 12" Tan with Dark Brown Speckles, Floor Tile / Mastic	0/10	N
WSC-7	0132244-007	400A, 12" Light Gray with Gray Speckles, Floor Tile / Mastic	0/10/0	N
WSC-8	0132244-008	400A, 12" Light Gray with Gray Speckles Floor Tile / Mastic	0/10	N
WSC-9	0132244-009	400A, 12" Light Gray with Gray Speckles, Floor Tile/ Mastic	0/0/0	N/A
WSC-10	0132244-010	400, Red Carpet / Adhesive	0/0/0	N/A
WSC-11	0132244-011	Conference, Red Carpet / Adhesive	0/0/0	N/A
WSC-12	0132244-012	401A, Red Carpet / Adhesive	0/0/0	N/A
WSC-13	0132244-013	409A, Blue Carpet / Adhesive	0/0/0	N/A
WSC-14	0132244-014	409A, Blue Carpet / Adhesive	0/0/0	N/A
WSC-15	0132244-015	409A, Blue Carpet / Adhesive	0/0/0	N/A
WSC-16	0132244-016	Southeast Stairwell, 12" Cream with Multi-Speckles, Floor Tile / Mastic	0/0	N/A
WSC-17	0132244-017	405, 12" Cream with Multi-Speckles, Floor Tile / Mastic	0/0	N/A
WSC-18	0132244-018	402, 12" Cream with Multi-Speckles, Floor Tile/ Mastic	0/0/0	N/A
WSC-19	0132244-019	Southeast Stairwell, Red Stair Tread / Adhesive	0/0/0	N/A
WSC-20	0132244-020	Northwest Stairwell, Red Stair Tread / Adhesive	0/0	N/A
WSC-21	0132244-021	409A, Brick and Mortar	0/0	N/A
WSC-22	0132244-022	409A, Brick and Mortar	0	N/A



Sample #	Lab Sample #	Material Location and Description	% Asbestos	Friable Y/N
WSC-23	0132244-023	Hallway, 6" Black Base Cove / Adhesive	0/0	N/A
WSC-24	0132244-024	401B, 6" Black Base Cove / Adhesive	0/0/0	N/A
WSC-25	0132244-025	406, 4" Red Base Cove / Adhesive	0/0	N/A
WSC-26	0132244-026	403, 4" Red Base Cove / Adhesive	0/0	N/A
WSC-27	0132244-027	400A, 6" Brown Base Cove / Adhesive	0/0	N/A
WSC-28	0132244-028	400A, 6" Brown Base Cove / Adhesive	0/0	N/A
WSC-29	0132244-029	406, Drywall	0/0	N/A
WSC-30	0132244-030	405, Drywall	0/0	N/A
WSC-31	0132244-031	Hallway, Drywall	0/0/0	N/A
WSC-32	0132244-032	Women's Restroom, Block / Wall Sealer / Paint	0	N/A
WSC-33	0132244-033	Stairwell Southeast, Door Caulk	0	N/A
WSC-34	0132244-034	400, Door Caulk	0	N/A
WSC-35	0132244-035	408, Window Glaze	0	N/A
WSC-36	0132244-036	403, Window Glaze	0	N/A
WSC-37	0132244-037	Interior of 409, Window Glaze	2	N
WSC-38	0132244-038	406, Window Caulk	0	N/A
WSC-39	0132244-039	401A, Window Caulk	0	N/A
WSC-40	0132244-040	409, 2' x 4' Dotted Ceiling Tile, White	0	N/A
WSC-41	0132244-041	406, 2' x 4' Dotted Ceiling Tile, White	0	N/A
WSC-42	0132244-042	Hallway, 2' x 4' Dotted Ceiling Tile, White	0	N/A
WSC-43	0132244-043	Hallway, 2' x 4' Dotted/ Small Wormed Ceiling Tile	0	N/A
WSC-44	0132244-044	402, 2' x 4' Dotted/ Small Wormed Ceiling Tile	0	N/A
WSC-45	0132244-045	403, 2' x 4' Dotted/ Small Wormed Ceiling Tile	0	N/A
WSC-46	0132244-046	405, 2' x 4' Large Wormed Ceiling Tile	0	N/A
WSC-47	0132244-047	Hallway, 2' x 4' Large Wormed Ceiling Tile	0	N/A
WSC-48	0132244-048	Hallway, 2' x 4' Large Wormed Ceiling Tile	0	N/A
WSC-49	0132244-049	400A, 2' x 2' Dotted Ceiling Tile, Yellow	0	N/A
WSC-50	0132244-050	400A, 2' x 2' Dotted Ceiling Tile, Yellow	0	N/A



Sample #	Lab Sample #	Material Location and Description	% Asbestos	Friable Y/N
WSC-51	0132244-051	400A, 2' x 2' Dotted Ceiling Tile, Yellow	0	N/A
WSC-52	0132244-052	Hallway, Duct Insulation	0/0	N/A
WSC-53	0132244-053	Hallway, Duct Insulation	0/0	N/A
WSC-54	0132244-054	Hallway, Duct Insulation	0/0	N/A
WSC-55	0132244-055	408, Sink Undercoating	10	N
WSC-56	0132357-001	Senior Center, 1st Floor Hall, Cementitious Ceiling Material/Mastic	0/0	N/A
WSC-57	0132357-002	Senior Center, 1st Floor Hall, Cementitious Ceiling Material/ Mastic	0/0	N/A
WSC-58	0132357-003	Senior Center, 1st Floor Hall, Cementitious Ceiling Material/Mastic	0/0	N/A
WSC-59	0132357-004	Senior Center, 1st Floor Hall, Brown Pipe Insulation	0/0	N/A
WSC-60	0132357-005	Senior Center, 1st Floor Hall, Brown Pipe Insulation	0/0	N/A
WSC-61	0132357-006	Senior Center, 1st Floor Hall, Brown Pipe Insulation	0/0	N/A
WSC-62	0132357-007	Senior Center, 1st Floor, 12" Ceiling Tile	0	N/A
WSC-63	0132357-008	Senior Center, 1st Floor 12" Ceiling Tile	0	N/A
WSC-64	0132357-009	Senior Center, 1st Floor 12" Ceiling Tile	0	N/A
WSC-65	0132357-010	Senior Center, 1st Floor, Heater Insulation	0/0	N/A
WSC-66	0132357-011	Senior Center, 1st Floor, Heater Insulation	0/0	N/A
WSC-67	0132357-012	Senior Center, 1st Floor, Heater Insulation	0/0	N/A
WSC-68	0132357-013	Senior Center, 1st Floor, 2' x 4' Wormed Ceiling Tile	0	N/A
WSC-69	0132357-014	Senior Center, 1st Floor, 2' x 4' Wormed Ciling Tile	0	N/A
WSC-70	0132357-015	Senior Center, 1st Floor, 2' x 4' Wormed Ciling Tile	0	N/A
WSC-71	0132357-016	Senior Center, 1st Floor, 2' x 4' Dotted Ceiling Tile	0	N/A
WSC-72	0132357-017	Senior Center, 1st Floor, 2' x 4' Dotted Ceiling Tile	0	N/A
WSC-73	0132357-018	Senior Center, 1st Floor, 2' x 4' Dotted Ceiling Tile	0	N/A
WSC-74	0132357-019	Senior Center, 1st Floor, 2' x 4' Pitted Ceiling Tile	0	N/A
WSC-75	0132357-020	Senior Center, 1st Floor, 2' x 4' Pitted Ceiling Tile	0	N/A



Sample #	Lab Sample #	Material Location and Description	% Asbestos	Friable Y/N
WSC-76	0132357-021	Senior Center, 1st Floor, 2' x 4' Pitted Ceiling Tile	0	N/A
WSC-77	0132357-022	Senior Center, 1st Floor, Room 303, 9" Ceiling Tile	0	N/A
WSC-78	0132357-023	Senior Center, 1st Floor, Room 303, 9" Ceiling Tile	0	N/A
WSC-79	0132357-024	Senior Center, 1st Floor, Room 303, 9" Ceiling Tile	0	N/A
WSC-80	0132357-025	Senior Center, 1st Floor, Brick / Mortar	0	N/A
WSC-81	0132357-026	Senior Center, 1st Floor, Brick / Mortar	0	N/A
WSC-82	0132357-027	Senior Center, 1st Floor, Ceramic Wall Tile / Blue	0	N/A
WSC-83	0132357-028	Senior Center, 1st Floor, Ceramic Wall Tile / Blue	0	N/A
WSC-84	0132357-029	Senior Center, 1st Floor, Door Caulk	0	N/A
WSC-85	0132357-030	Senior Center, 1st Floor, Door Caulk	0	N/A
WSC-86	0132357-031	Senior Center, 1st Floor, Window Caulk	0	N/A
WSC-87	0132357-032	Senior Center, 1st Floor, Window Caulk	0	N/A
WSC-88	0132357-033	Senior Center, 1st Floor, Drywall	0/0	N/A
WSC-89	0132357-034	Senior Center, 1st Floor, Drywall	0/0	N/A
WSC-90	0132357-035	Senior Center, 1st Floor, Drywall	0/0	N/A
WSC-91	0132357-036	Senior Center, 1st Floor, Janitor, Pipe Insulation / Patch	0/0/30	Y
WSC-92	0132357-037	Senior Center, 1st Floor, 6" Black Base Cove / Mastic	0/0/0	N/A
WSC-93	0132357-038	Senior Center, 1st Floor, 6" Black Base Cove / Mastic	0/0/0	N/A
WSC-94	0132357-039	Senior Center, 1st Floor 4" Brown Base Cove / Mastic	0/0	N/A
WSC-95	0132357-040	Senior Center, 1st Floor, 4" Brown Base Cove / Mastic	0/0	N/A
WSC-96	0132357-041	Senior Center, 1st Floor, 9" Red Tile / Mastic	5/10	N
WSC-97	0132357-042	Senior Center, 1st Floor, 9" Red Tile / Mastic	5/5	N
WSC-98	0132357-043	Senior Center, 1st Floor, 9" Red Tile / Mastic	5/5	N
WSC-99	0132357-044	Senior Center, 1st Floor, White / Black Speckled Terrazzo	0	N/A
WSC-100	0132357-045	Senior Center, 1st Floor, White / Black Speckled Terrazzo	0	N/A
WSC-101	0132357-046	Senior Center, 1st Floor 12" Ivory Floor Tile / Mastic	0/0/0	N/A
WSC-102	0132357-047	Senior Center, 1st Floor 12" Ivory Floor Tile / Mastic	0/0/0	N/A



Sample #	Lab Sample #	Material Location and Description	% Asbestos	Friable Y/N
WSC-103	0132357-048	Senior Center, 1st Floor 12" Ivory Floor Tile / Mastic	0/0	N/A
WSC-104	0132357-049	Senior Center 1st Floor 12" White Floor Tile / Mastic	3/10	N
WSC-105	0132357-050	Senior Center 1st Floor 12" White Floor Tile / Mastic	3/10	N
WSC-106	0132357-051	Senior Center 1st Floor 12" White Floor Tile / Mastic	3/10	N
GWP-1	0132358-001	Gatewood Peep, 12" Yellow Floor Tile/ Mastic	0/0	N/A
GWP-2	0132358-002	Gatewood Peep, 12" Yellow Floor Tile/ Mastic	0/0	N/A
GWP-3	0132358-003	Gatewood Peep, 12" Yellow Floor Tile/ Mastic	0/0	N/A
GWP-4	0132358-004	Gatewood Peep, 12" Orange Floor Tile/ Mastic	0/0	N/A
GWP-5	0132358-005	Gatewood Peep, 12" Orange Floor Tile/ Mastic	0/0/0	N/A
GWP-6	0132358-006	Gatewood Peep, 12" Orange Floor Tile/ Mastic	0/0/0	N/A
GWP-7	0132358-007	Gatewood Peep, 12" Red Floor Tile/ Mastic	0/0/0	N/A
GWP-8	0132358-008	Gatewood Peep, 12" Red Floor Tile/ Mastic	0/0	N/A
GWP-9	0132358-009	Gatewood Peep, 12" Red Floor Tile/ Mastic	0/0	N/A
GWP-10	0132358-010	Gatewood Peep Left, 2' x 4' Wormed Ceiling Tile	0	N/A
GWP-11	0132358-011	Gatewood Peep Middle, 2' x 4' Wormed Ceiling Tile	0	N/A
GWP-12	0132358-012	Gatewood Peep Right, 2' x 4' Wormed Ceiling Tile	0	N/A
GWP-13	0132358-013	Gatewood Peep, Pipe Insulation	0/0	N/A
GWP-14	0132358-014	Gatewood Peep, Pipe Insulation	0/0	N/A
GWP-15	0132358-015	Gatewood Peep, Pipe Insulation	0/0	N/A
GWP-16	0132358-016	Gatewood Peep, Multi-Colored Carpet/ Mastic	0/0/0	N/A
GWP-17	0132358-017	Gatewood Peep, Multi-Colored Carpet/ Mastic	0/0/0	N/A
GWP-18	0132358-018	Gatewood Peep, Multi-Colored Carept/ Mastic	0/0/0	N/A
GWP-19	0132358-019	Gatewood Peep, 4" Tan Base Cove/ Mastic	0/0	N/A
GWP-20	0132358-020	Gatewood Peep, 4" Tan Base Cove/ Mastic	0/0	N/A
GWP-21	0132358-021	Gatewood Peep, 4" Brown Base Cove/ Mastic	0/0	N/A
GWP-22	0132358-022	Gatewood Peep, 4" Brown Base Cove/ Mastic	0/0	N/A

Comments

1. The following sampled materials tested positive for asbestos:
 - Mastic under 12” Pinkish-Brown w/ Dark Speckled Floor Tile (Women’s Room)
 - 12” Tan w/ Dark Brown Speckled Floor Tile/ Mastic (Women’s Room, Room 408, 400A)
 - Mastic under 12” Light Gray w/ Gray Speckled Floor Tile (Room 400A)
 - Interior Window Glaze (Room 409)
 - Sink Undercoating (Room 408)
 - Beige Pipe Insulation (1st Floor Senior Center Janitor’s Room)
 - 9” Red Tile and Mastic (1st Floor Senior Center Janitor’s Room)
 - 12” White Floor Tile and Mastic (1st Floor Senior Center Clinic Bathroom)

2. Asbestos might be found within the walls, ceiling and or pipe chases during the renovation or demolition of the building. If any suspect materials are found, they should be treated as asbestos or tested for asbestos.

Approximate Quantities of Asbestos Materials

<u>ASBESTOS CONTAINING MATERIALS</u>	<u>QUANTITY</u>
Mastic under 12” Pinkish-Brown w/ Dark Speckled Floor Tile (Women’s Room)	500 Sq. Ft.
12” Tan w/ Dark Brown Speckled Floor Tile/ Mastic (Women’s Room 408, 400A)	600 Sq. Ft.
Mastic under 12” Light Gray w/ Gray Speckled Floor Tile (Room 400A)	100 Sq. Ft.
Interior Window Glaze (Room 409)	100 Lin Ft.
Sink Undercoating (Room 408)	1 Sink
Beige Pipe Insulation (1 st Floor Senior Center Janitor’s Room)	20 Lin. Ft.
9” Red Tile and Mastic(1 st Floor Senior Center Janitor’s Room)	75 Sq. Ft.
12” White Floor Tile and Mastic (1 st Floor Senior Center Clinic Bathroom)	240 Sq. Ft.



Marine Chemist Service, Inc.

SECTION 3 General Legend and Notes

GENERAL LEGEND

O - Sample number/location - non-asbestos

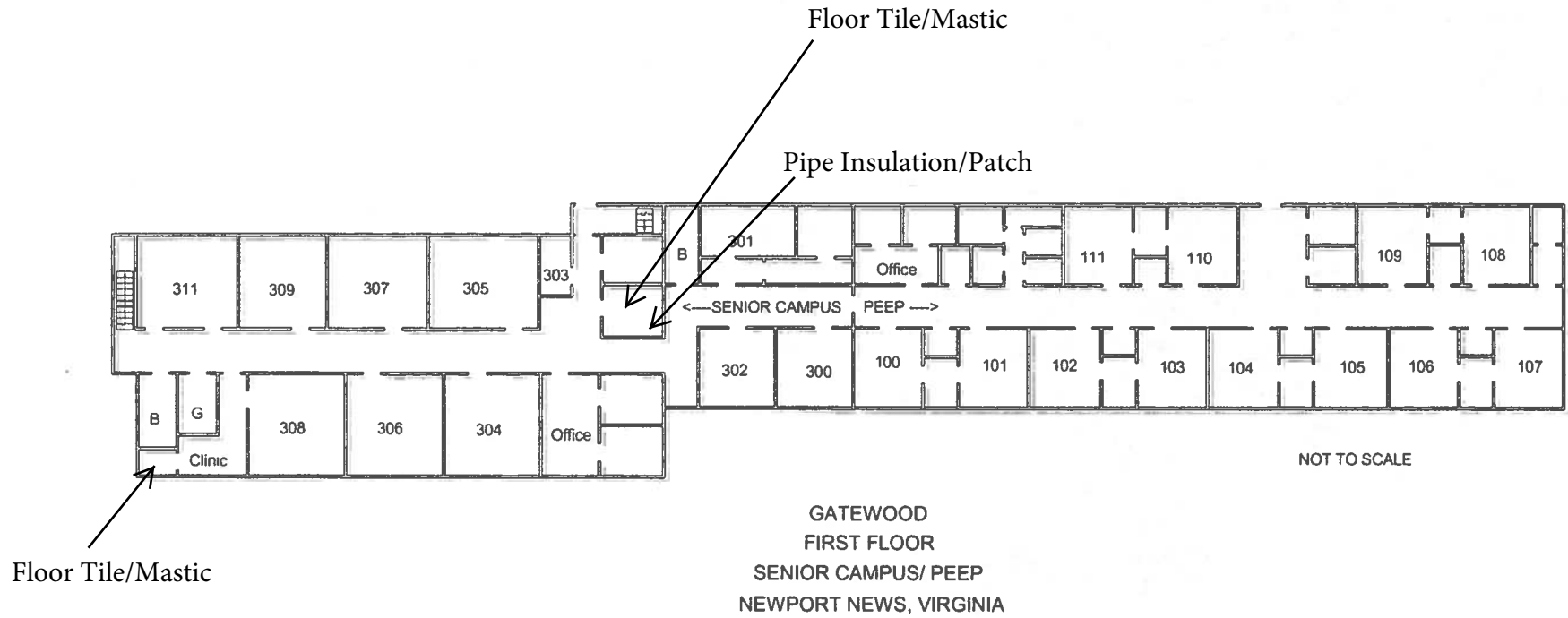
△ - Sample number/location - contains asbestos

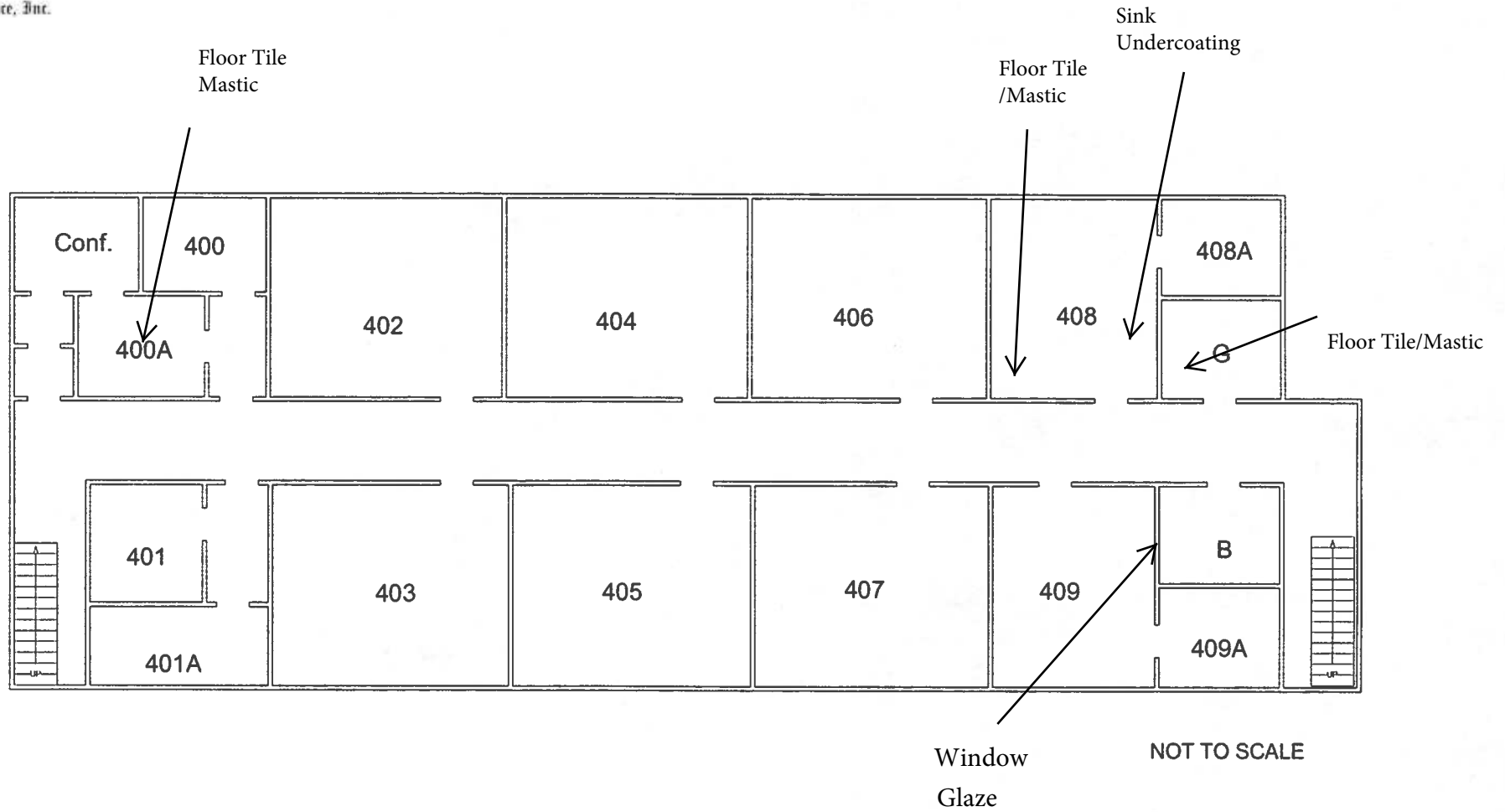
GENERAL NOTES

1. The EPA's definition of a friable material is one that contains more than 1% asbestos by weight and can be crumbled, pulverized or reduced to a powder by hand pressure when dry, or which under normal use or maintenance emits or can be expected to emit asbestos fibers into the air.
2. All quantities are approximate.

SECTION 4

Asbestos Containing Material Sketches



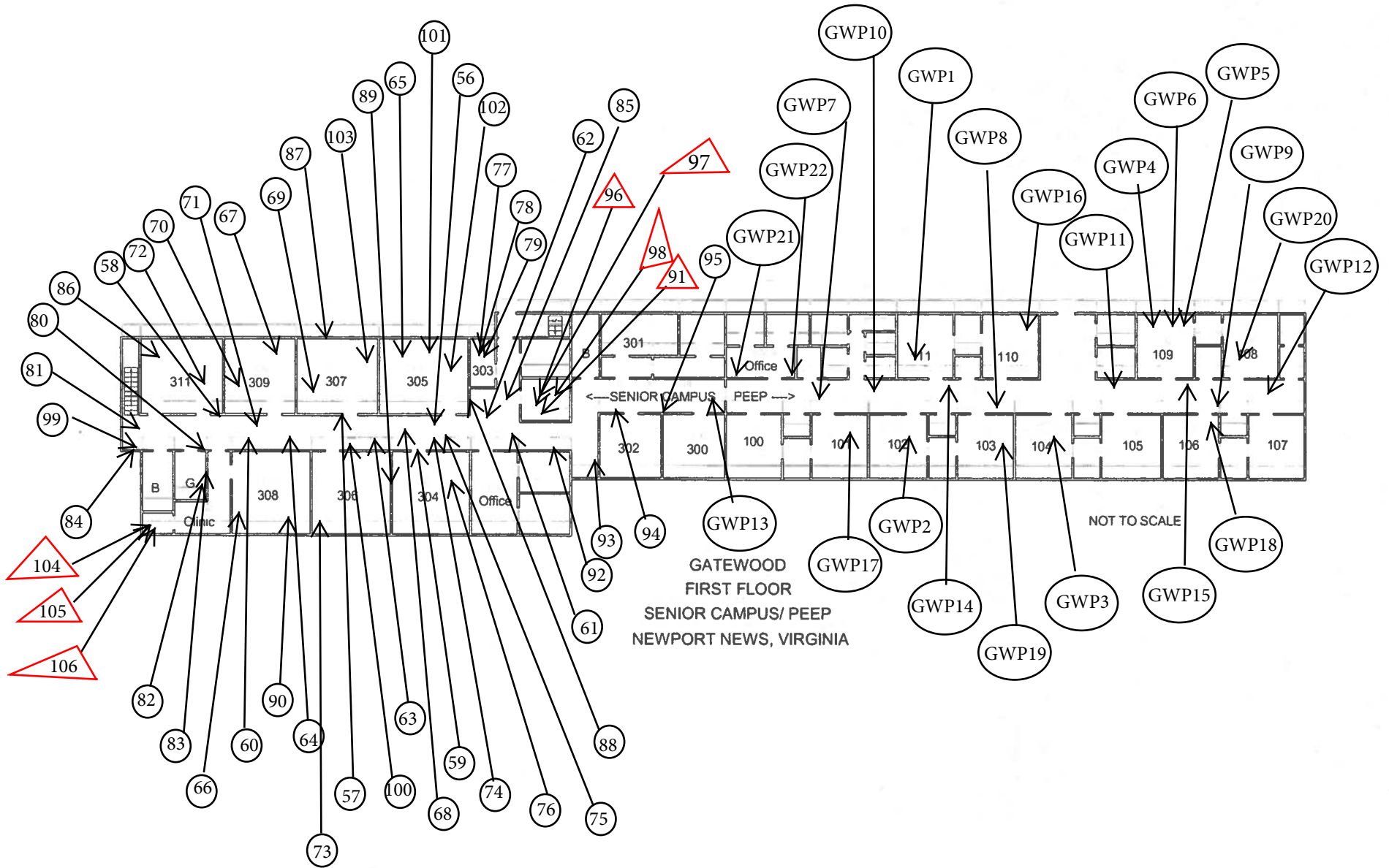


GATEWOOD
SECOND FLOOR
SENIOR CAMPUS
NEWPORT NEWS, VIRGINIA

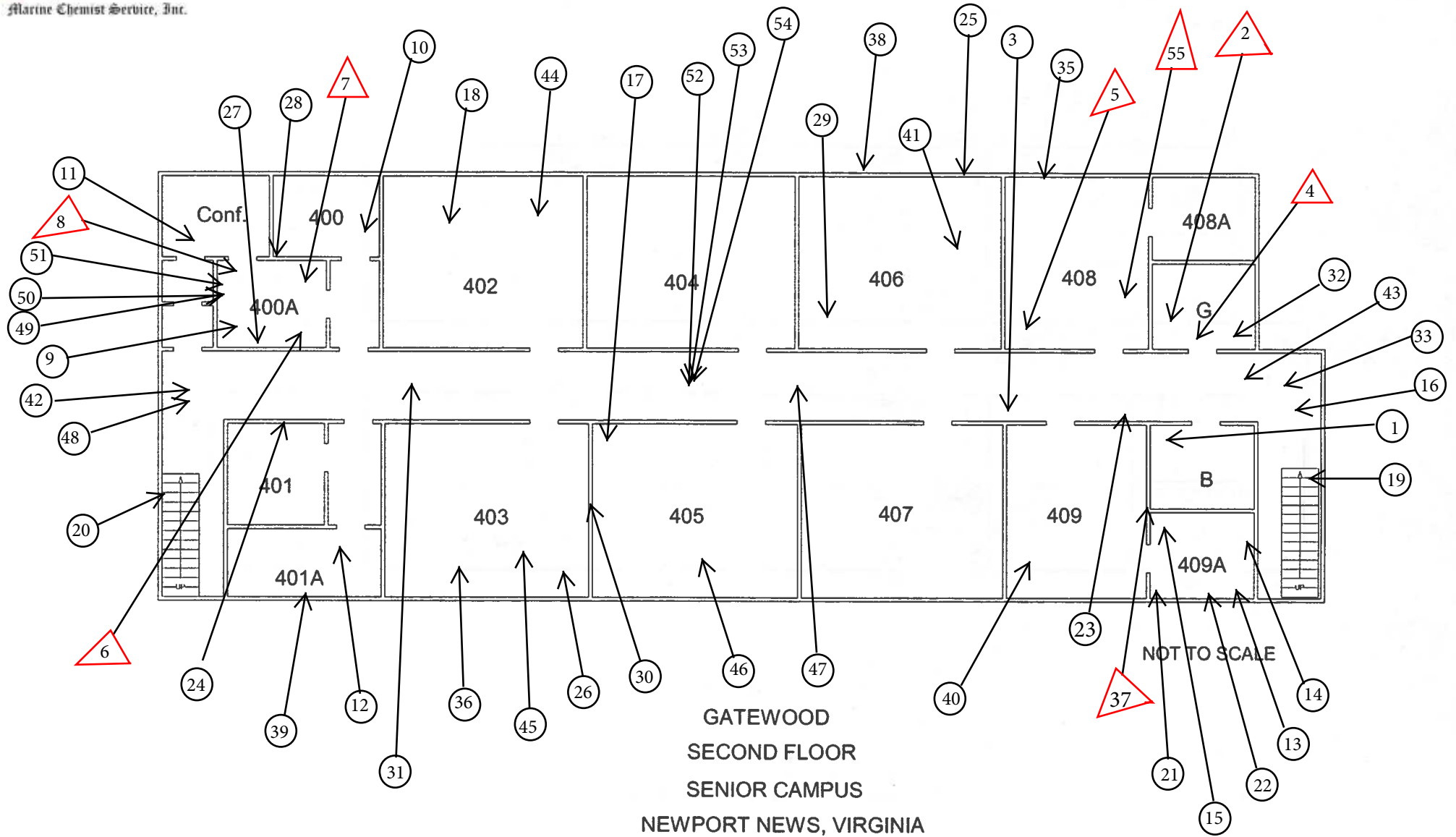


SECTION 5

Survey Sample Location Sketches



GATEWOOD
FIRST FLOOR
SENIOR CAMPUS/ PEEP
NEWPORT NEWS, VIRGINIA



SECTION 6 Reports of Analysis



Marine Chemist Service, Inc.
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 NEWPORT NEWS, VA 23606-2527
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 FAX: (757) 873-1074 · NORFOLK (757) 625-5696
www.MarineChemist.com

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

MCS Report No.: 0132244
Report Date: 04/01/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-001	Men's Restroom, 12" Floor Tile/ Mastic, Pinkish-Brown w/ Dark Specs					
WSC-1	Floor Tile, White	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	10%
					Non-Fibrous Material	90%
	Asbestos Present: No	Total % Asbestos:	No Asbestos Detected			
0132244-002	Women's Restroom, 12" Floor Tile/ Mastic, Pinkish-Brown w/ Dark Specs					
WSC-2	Floor Tile, White	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Black	LAYER 2 10%	Chrysotile	10%	Cellulose Fiber	20%
					Non-Fibrous Material	70%
	Asbestos Present: Yes	Total % Asbestos:	1%			
0132244-003	Hallway, 12" Floor Tile/ Mastic, Pinkish- Brown w/ Dark Specs					
WSC-3	Floor Tile, White	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Flooring Material, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	5%
					Non-Fibrous Material	95%
	Asbestos Present: No	Total % Asbestos:	No Asbestos Detected			



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 FAX: (757) 873-1074 · NORFOLK (757) 625-5696
www.MarineChemist.com

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

MCS Report No.: 0132244
Report Date: 04/01/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-004	Women's Restroom, 12" Floor Tile/ Mastic, Tan w/ Many Dark Brown Specs					
WSC-4	Floor Tile, White	LAYER 1 80%	Chrysotile	2%	Non-Fibrous Material	98%
	Mastic, Black	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	10% 80%
	Asbestos Present: Yes		Total % Asbestos:	4%		
0132244-005	408, 12" Floor Tile/ Mastic, Tan w/ Many Dark Brown Specs					
WSC-5	Floor Tile, Beige	LAYER 1 80%	Chrysotile	3%	Non-Fibrous Material	97%
	Mastic, Black	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	10% 80%
	Asbestos Present: Yes		Total % Asbestos:	4%		
0132244-006	400A, 12" Floor Tile/ Mastic, Tan w/ Many Dark Brown Specs					
WSC-6	Floor Tile, Beige	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Black	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	10% 80%
	Asbestos Present: Yes		Total % Asbestos:	2%		



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Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132244
Report Date: 04/01/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-007	400A, 12" Floor Tile / Mastic, Light Gray w/ Gray Specs					
WSC-7	Floor Tile, White	LAYER 1 70%	None Detected		Non-Fibrous Material	100%
	Mastic, Black	LAYER 2 20%	Chrysotile	10%	Non-Fibrous Material	90%
	Flooring Material, Gray	LAYER 3 10%	None Detected		Cellulose Fiber	5%
					Non-Fibrous Material	95%
	Asbestos Present: Yes		Total % Asbestos:	2%		
0132244-008	400A, 12" Floor Tile/ Mastic, Light Gray w/ Gray Specs					
WSC-8	Floor Tile, White	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Black and Beige	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber	10%
					Non-Fibrous Material	80%
	Asbestos Present: Yes		Total % Asbestos:	2%		



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www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-009	400A, 12" Floor Tile/ Mastic, Light Gray w/ Gray Specs			
WSC-9	Floor Tile, Beige	LAYER 1 80%	None Detected	Non-Fibrous Material 100%
	Mastic, Beige	LAYER 2 10%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
	Flooring Material, Beige	LAYER 3 10%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-010	400, Red Carpet/ Adhesive			
WSC-10	Carpet, Red	LAYER 1 50%	None Detected	Synthetic Fiber 80% Non-Fibrous Material 20%
	Fibrous Material, Beige	LAYER 2 40%	None Detected	Cellulose Fiber 90% Non-Fibrous Material 10%
	Mastic, Beige	LAYER 3 10%	None Detected	Cellulose Fiber 5% Synthetic Fiber 5% Non-Fibrous Material 90%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-011 WSC-11	Conference, Red Carpet/ Adhesive Carpet, Red	LAYER 1 60%	None Detected	Synthetic Fiber 80% Non-Fibrous Material 20%
	Fibrous Material, Beige	LAYER 2 20%	None Detected	Synthetic Fiber 60% Cellulose Fiber 10% Non-Fibrous Material 30%
	Mastic, Beige	LAYER 3 20%	None Detected	Cellulose Fiber 10% Non-Fibrous Material 90%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-012 WSC-12	401A, Red Carpet/ Adhesive Carpet, Red	LAYER 1 60%	None Detected	Synthetic Fiber 80% Non-Fibrous Material 20%
	Fibrous Material, Beige	LAYER 2 20%	None Detected	Synthetic Fiber 60% Non-Fibrous Material 40%
	Mastic, Beige	LAYER 3 20%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-013 WSC-13	409A, Blue Carpet/ Adhesive Carpet, Blue	LAYER 1 70%	None Detected		Synthetic Fiber Non-Fibrous Material	80% 20%
	Fibrous Material, Beige	LAYER 2 20%	None Detected		Synthetic Fiber Non-Fibrous Material	60% 40%
	Mastic, Beige	LAYER 3 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-014 WSC-14	409A, Blue Carpet/ Adhesive Carpet, Blue	LAYER 1 60%	None Detected		Synthetic Fiber Non-Fibrous Material	80% 20%
	Fibrous Material, Beige	LAYER 2 30%	None Detected		Synthetic Fiber Non-Fibrous Material	60% 40%
	Mastic, Beige	LAYER 3 10%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-015 WSC-15	409A, Blue Carpet/Adhesive			
	Carpet, Blue	LAYER 1 60%	None Detected	Synthetic Fiber 80% Non-Fibrous Material 20%
	Fibrous Material, Beige	LAYER 2 30%	None Detected	Synthetic Fiber 60% Non-Fibrous Material 40%
	Mastic, Beige	LAYER 3 10%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-016 WSC-16	Southeast Stairwell, 12" Cream w/ Multi-Specs Floor Tile/ Mastic			
	Floor Tile, Beige	LAYER 1 90%	None Detected	Non-Fibrous Material 100%
	Mastic, Beige	LAYER 2 10%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-017	405, 12" Cream w/ Multi-Specs Floor Tile/ Mastic			
WSC-17	Floor Tile, Beige	LAYER 1 90%	None Detected	Non-Fibrous Material 100%
	Mastic, Beige	LAYER 2 10%	None Detected	Cellulose Fiber 10% Non-Fibrous Material 90%
Asbestos Present: No		Total % Asbestos:	No Asbestos Detected	
0132244-018	402, 12" Cream w/ Multi-Specs Floor Tile/ Mastic			
WSC-18	Floor Tile, White	LAYER 1 80%	None Detected	Non-Fibrous Material 100%
	Mastic, Beige	LAYER 2 10%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
	Flooring Material, Gray	LAYER 3 10%	None Detected	Cellulose Fiber 10% Non-Fibrous Material 90%
Asbestos Present: No		Total % Asbestos:	No Asbestos Detected	



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-019	Southeast Stairwell, Red Stair Tread/ Adhesive					
WSC-19	Stair Tread, Pink	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
	Floor Tile, White	LAYER 3 10%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-020	Northwest Stairwell, Red Stair Tread/ Adhesive					
WSC-20	Stair Tread, Pink	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-021 WSC-21	409A, Brick and Mortar Cementitious Material, Gray	LAYER 1 60%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
	Cementitious Material, Beige	LAYER 2 40%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-022 WSC-22	409A, Brick and Mortar Cementitious Material, Gray	LAYER 1 100%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
	Asbestos Present: No		Total % Asbestos:		No Asbestos Detected	
0132244-023 WSC-23	Hallway, 6" Black Base Cove/ Adhesive Cove Base, Black	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
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		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-024 WSC-24	401B, 6" Black Base Cove/ Adhesive Cove Base, Black	LAYER 1 70%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
	Paper, Brown	LAYER 3 10%	None Detected		Cellulose Fiber Non-Fibrous Material	90% 10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-025 WSC-25	406, 4" Red Base Cove/ Adhesive Cove Base, Red	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige and White	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
	Asbestos Present: No		Total % Asbestos:		No Asbestos Detected	
0132244-026 WSC-26	403, 4" Red Base Cove/ Adhesive Cove Base, Red	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
	Asbestos Present: No		Total % Asbestos:		No Asbestos Detected	



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Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-027 WSC-27	400A, 6" Brown Base Cove/ Adhesive			
	Cove Base, Brown	LAYER 1 80%	None Detected	Non-Fibrous Material 100%
	Mastic, Beige	LAYER 2 20%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-028 WSC-28	400A, 6" Brown Base Cove/ Adhesive			
	Cove Base, Brown	LAYER 1 90%	None Detected	Non-Fibrous Material 100%
	Mastic, Beige	LAYER 2 10%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-029 WSC-29	406, Drywall			
	Paper, Brown	LAYER 1 30%	None Detected	Cellulose Fiber 90% Non-Fibrous Material 10%
	Drywall, Beige	LAYER 2 70%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132244
Report Date: 04/01/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-030 WSC-30	405, Drywall Brown Paper, White Paint	LAYER 1 40%	None Detected	Cellulose Fiber 90% Non-Fibrous Material 10%
	Drywall, Gray	LAYER 2 60%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-031 WSC-31	Hallway, Drywall Joint Compound, White	LAYER 1 20%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
	Paper, Brown	LAYER 2 30%	None Detected	Cellulose Fiber 90% Non-Fibrous Material 10%
	Drywall, White	LAYER 3 50%	None Detected	Cellulose Fiber 5% Non-Fibrous Material 95%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-032 WSC-32	Women's Restroom, Block/ Wall Sealer/ Paint Gray Sealer, White Paint	LAYER 1 100%	None Detected	Non-Fibrous Material 100%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

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Report Date: 04/01/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-033 WSC-33	Stairwell Southeast, Door Caulk Gray Caulk, White and Green Paint	LAYER 1 100%	None Detected		Cellulose Fiber Non-Asbestos Residue	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-034 WSC-34	400, Door Caulk Caulking and Paint, White	LAYER 1 100%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-035 WSC-35	408, Window Glaze Glazing, Black	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-036 WSC-36	403, Window Glaze Glazing, White and Black	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

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MCS Report No.: 0132244
Report Date: 04/01/2021
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Customer PO No.:

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-037 WSC-37	Interior 409, Window Glaze Glazing, Gray	LAYER 1 100%	Chrysotile	2%	Wollastonite Non-Fibrous Material	5% 93%
Asbestos Present: Yes		Total % Asbestos:		2%		
0132244-038 WSC-38	406, Window Caulk Caulking, White	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-039 WSC-39	401A, Window Caulk Caulking, White	LAYER 1 100%	None Detected		Wollastonite Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132244-040 WSC-40	409, 2'x4' Dotted Ceiling Tile White Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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MCS Report No.: 0132244
Report Date: 04/01/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-041 WSC-41	406, 2'x4' Dotted Ceiling Tile White Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-042 WSC-42	Hallway, 2'x4' Dotted Ceiling Tile White Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-043 WSC-43	Hallway, 2'x4' Dotted/ Small Worm Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-044 WSC-44	402, 2'x4' Dotted/ Small Worm Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS
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MCS Report No.: 0132244
Report Date: 04/01/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-045 WSC-45	403, 2'x4' Dotted/ Small Worm Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-046 WSC-46	405, 2'x4' Large Worm Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-047 WSC-47	Hallway, 2'x4' Large Worm Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-048 WSC-48	Hallway, 2'x4' Large Worm Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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 Attn: Pennie Robbins Boyack
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 Newport News VA 23602

Date Sampled: 02/22/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132244
Report Date: 04/01/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 02/22/2021
Received By: JAS
Sample Matrix: BULK
Date Analyzed: 02/25/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-049 WSC-49	400A, 2'x2' Dotted Ceiling Tile Yellow Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-050 WSC-50	400A, 2'x2' Dotted Ceiling Tile Yellow Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-051 WSC-51	400A, 2'x2' Dotted Ceiling Tile Yellow Ceiling Tile, Beige	LAYER 1 100%	None Detected	Cellulose Fiber 30% Fibrous Glass 20% Non-Fibrous Material 50%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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Job Location: Warwick Senior Center (2nd Floor)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132244-052 WSC-52	Hallway, Duct Insulation Jacket, White	LAYER 1 40%	None Detected	Cellulose Fiber 40% Fibrous Glass 40% Non-Fibrous Material 20%
	Insulation, Yellow	LAYER 2 60%	None Detected	Fibrous Glass 90% Non-Fibrous Material 10%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-053 WSC-53	Hallway, Duct Insulation Jacket, White	LAYER 1 40%	None Detected	Cellulose Fiber 40% Fibrous Glass 40% Non-Fibrous Material 20%
	Insulation, Yellow	LAYER 2 60%	None Detected	Fibrous Glass 90% Non-Fibrous Material 10%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		
0132244-054 WSC-54	Hallway, Duct Insulation Jacket, White	LAYER 1 40%	None Detected	Cellulose Fiber 40% Fibrous Glass 40% Non-Fibrous Material 20%
	Insulation, Yellow	LAYER 2 60%	None Detected	Fibrous Glass 90% Non-Fibrous Material 10%
Asbestos Present: No		Total % Asbestos: No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
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		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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Sampled By: Ryan Stanley
Job Location: Warwick Senior Center (2nd Floor)

Date Received: 02/22/2021
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Sample Matrix: BULK
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Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132244-055	408, Sink Undercoating					
WSC-55	Undercoating, Black and White	LAYER 1	Chrysotile	10%	Cellulose Fiber	5%
		100%			Non-Fibrous Material	85%
Asbestos Present: Yes		Total % Asbestos:		10%		

NOTE: Original report dated 03/02/2021 was amended for Sample Descriptions of samples 0132244-052, 0132244-053 and 0132244-054.


 Analyst - Mary Helen Scott


 Approved Signatory - Mary Helen Scott
 Laboratory Supervisor

- Method Detection Limit: = <1%
- * Fiber concentrations were determined by visually estimating the area percentage for each type.
 - * Asbestos fibers may not be detected by PLM in certain samples because of their size (<5um) or being bound with non-friable organic matrix. In such cases an alternative method of analysis may be necessary.
 - * Analyzed only readily discernable layers.
 - * All laboratory test results meet the applicable quality control requirements unless otherwise mentioned.
 - * MCS, Inc. can not attest to nor be held responsible for the proper collection of samples and/or accuracy of the sample information provided by customers for samples not collected by MCS, Inc.
 - * Test report relates only to the items tested.
 - * The samples will be stored at the MCS, Inc. laboratory for a period of thirty days after the analysis. At the end of the period, it will be our policy to dispose of the samples unless prior arrangements have been made for a longer storage period.
 - * This report shall not be reproduced, except in full, without the written approval of this laboratory.
 - * The Report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the Federal Government.
 - * The Report includes Chain of Custody.



Marine Chemist Service, Inc.

11850 Tug Boat Lane • Newport News, VA 23606

(757) 873-0933 • (757) 873-1074 (fax)

www.MarineChemist.com

Customer: Newport News Public Schools

Address: 12465 Warwick Blvd, NN, VA

Email: pennie.boyardk@nn.k12.va.us

Attention: Pennie Boyark

Phone: 757-881-6024

Fax: 757-249-5638

MCS Job #: 21-0225

Customer PO: ---

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Warwick Senior Center,
2nd Floor

Requested Turnaround Time (markup)

- Building Material
- Paint
- Soil
- Other _____

- Same Day (100%)
- 1-Day (75%)
- 2-Day (50%)
- 3-Day (25%)
- 4-Day (12.5%)
- 5-Day (standard)

RESULTS DUE BY: 3/1/21

ANALYSIS: PLM

MCS Use Only

Special Instructions: _____

MCS Project Manager: _____

DO NOT MAIL Give Report To: _____

Email: _____ @ _____

MCS Lab Report No. 0132244 28 2/22/21

Samples Acceptable to Lab Yes No By _____

Date _____ If "No" Reason _____

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
WSC-1	Mens restroom	12" floortile/mastic, pinkish brown w/ dark specs	0132244-001
WSC-2	women restroom	12" floortile/mastic, pinkish-brown w/ dark specs	0132244-002
WSC-3	hallway	12" floortile/mastic, pinkish-brown w/ dark specs	0132244-003
WSC-4	women restroom	12" floortile/mastic, tan w/ many dark brown specs	0132244-004
WSC-5	408	12" floortile/mastic, tan w/ many dark brown specs	0132244-005
WSC-6	400A	12" floortile/mastic, tan w/ many dark brown specs	0132244-006
WSC-7	400A	12" floortile/mastic, light gray w/ gray specs	0132244-007
WSC-8	400A	12" floortile/mastic, light gray w/ gray specs	0132244-008
WSC-9	400A	12" floortile/mastic, light gray w/ gray specs	0132244-009
WSC-10	400	red carpet/adhesive	0132244-010
WSC-11	conference	red carpet/adhesive	0132244-011
WSC-12	401A	red carpet/adhesive	0132244-012
WSC-13	409A	blue carpet/adhesive	0132244-013
WSC-14	409A	blue carpet/adhesive	0132244-014
WSC-15	409A	blue carpet/adhesive	0132244-015
WSC-16	southeast stairwell	12" cream w/ multi-specs floortile/mastic	0132244-016
WSC-17	405	12" cream w/ multi-specs floortile/mastic	0132244-017
WSC-18	402	12" cream w/ multi-specs floortile/mastic	0132244-018
WSC-19	southeast stairwell	red stair tread/mastic adhesive	0132244-019
WSC-20	northwest stairwell	red stair tread/mastic adhesive	0132244-020

Ryan Stanley
Sampled by (Print)

[Signature]
Signature

2/22/21
Date/Time

[Signature]
Verbal _____

Kallie Brown
Transported by (Print)

[Signature]
Signature

2/22/21
Date/Time

Faxed _____
Copied 3/3/21 Put

Jennie Swain
Received by (Print)

[Signature]
Signature

2/22/21 15:19
Date/Time

Emailed _____
(date and initial above areas)

Mailed Billing



Marine Chemist Service, Inc.
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 (757) 873-0933 • (757) 873-1074 (fax)
 www.MarineChemist.com

Customer: Newport News Public Schools Page 2 of 3
 Address: 12465 Warwick Blvd, NN, VA
 Email: Pennie.boyack@nn.k12.va.us
 Attention: Pennie Boyack
 Phone: 757-881-5024 Fax: 757-249-5638
 MCS Job #: 21-0225 Customer PO: _____

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Warwick Senior Center, 2nd Floor

- Requested Turnaround Time (markup)
- | | |
|---|--|
| <input checked="" type="checkbox"/> Building Material | <input type="checkbox"/> Same Day (100%) |
| <input type="checkbox"/> Paint | <input type="checkbox"/> 1-Day (75%) |
| <input type="checkbox"/> Soil | <input type="checkbox"/> 2-Day (50%) |
| <input type="checkbox"/> Other _____ | <input type="checkbox"/> 3-Day (25%) |
| | <input type="checkbox"/> 4-Day (12.5%) |
| | <input checked="" type="checkbox"/> 5-Day (standard) |

RESULTS DUE BY: 3/1/21
 ANALYSIS: PLM

MCS Use Only

Special Instructions: _____

MCS Project Manager: _____

DO NOT MAIL Give Report To: _____

Email: _____ @ _____

MCS Lab Report No. 0132244 76 2/22/21

Samples Acceptable to Lab Yes No By _____

Date _____ If "No" Reason _____

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
WSC-21	409A	brick and mortar	0132244-021
WSC-22	409A	brick and mortar	0132244-022
WSC-23	hallway	6" black base coat/adhesive	0132244-023
WSC-24	401B	6" black base coat/adhesive	0132244-024
WSC-25	406	4" red base coat/adhesive	0132244-025
WSC-26	403	4" red base coat/adhesive	0132244-026
WSC-27	400A	6" brown base coat/adhesive	0132244-027
WSC-28	400A	6" brown base coat/adhesive	0132244-028
WSC-29	406	drywall	0132244-029
WSC-30	405	drywall	0132244-030
WSC-31	hallway	drywall	0132244-031
WSC-32	women restroom	block/wall sealer/paint	0132244-032
WSC-33	stairwell southeast	door caulk	0132244-033
WSC-34	400	door caulk	0132244-034
WSC-35	408	window glaze	0132244-035
WSC-36	403	window glaze	0132244-036
WSC-37	interior 409	window glaze	0132244-037
WSC-38	406	window caulk	0132244-038
WSC-39	400 401A	window caulk	0132244-039
WSC-40	409	2'x4' dotted ceiling tile white	0132244-040

Ryan Stanley
 Sampled by (Print)
Kallie Brown
 Transported by (Print)
Jennie Swan
 Received by (Print)

[Signature]
 Signature
[Signature]
 Signature
[Signature]
 Signature

2/22/21
 Date/Time
2/22/21
 Date/Time
2/22/21 15:19
 Date/Time

OFFICE USE ONLY:

Verbal _____
 Faxed _____
 Copied _____
 Emailed _____
 (date and initial above areas)

Mailed Billing



Marine Chemist Service, Inc.
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 (757) 873-0933 • (757) 873-1074 (fax)
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Customer: Newport News Public Schools
 Address: 2465 Warwick Blvd, NN, VA
 Email: penne.boayack@nn-k12.va.us
 Attention: Pennie Boyack
 Phone: 757-881-5024 Fax: 757-249-5638
 MCS Job #: 21-0225 Customer PO: _____

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Warwick Senior Center, 2nd Floor

Requested Turnaround Time (markup)

<input checked="" type="checkbox"/> Building Material	<input type="checkbox"/> Same Day (100%)
<input type="checkbox"/> Paint	<input type="checkbox"/> 1-Day (75%)
<input type="checkbox"/> Soil	<input type="checkbox"/> 2-Day (50%)
<input type="checkbox"/> Other _____	<input type="checkbox"/> 3-Day (25%)
	<input type="checkbox"/> 4-Day (12.5%)
	<input checked="" type="checkbox"/> 5-Day (standard)

RESULTS DUE BY: 3/1/21
 ANALYSIS: PLM

MCS Use Only

Special Instructions: _____

MCS Project Manager: _____

DO NOT MAIL Give Report To: _____

Email: _____ @ _____

MCS Lab Report No. 0132244 8 2/22/21

Samples Acceptable to Lab Yes No By _____

Date _____ If "No" Reason _____

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
WSC-41	406	2'x4' dotted ceiling tile white	0132244-041
WSC-42	hallway	2'x4' dotted ceiling tile white	0132244-042
WSC-43	hallway	2'x4' dotted / small worm ceiling tile	0132244-043
WSC-44	402	2'x4' dotted / small worm ceiling tile	0132244-044
WSC-45	403	2'x4' dotted / small worm ceiling tile	0132244-045
WSC-46	405	2'x4' large worm ceiling tile	0132244-046
WSC-47	hallway	2'x4' large worm ceiling tile	0132244-047
WSC-48	hallway	2'x4' large worm ceiling tile	0132244-048
WSC-49	400A 400A	2'x2' dotted ceiling tile yellow	0132244-049
WSC-50	400B 400A	2'x2' dotted ceiling tile yellow	0132244-050
WSC-51	400C 400A	2'x2' dotted ceiling tile yellow	0132244-051
WSC-52	hallway	duct insulation	0132244-052
WSC-53	hallway	duct insulation	0132244-053
WSC-54	hallway	duct insulation	0132244-054
WSC-55	408	sink undercoating	0132244-055

Ryan Stanley		2/22/21	<p>OFFICE USE ONLY:</p> <p>Verbal _____</p> <p>Faxed _____</p> <p>Copied _____</p> <p>Emailed _____</p> <p>(date and initial above areas)</p> <p><input type="checkbox"/> Mailed <input type="checkbox"/> Billing</p>
Sampled by (Print)	Signature	Date/Time	
Kallie Brown		2/22/21	
Transported by (Print)	Signature	Date/Time	
Jennie Swain		2/22/21 15:19	
Received by (Print)	Signature	Date/Time	



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www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-001	1st Floor Hall, Cementitious Ceiling Material/ Mastic					
WSC-56	Cementitious Material, Gray	LAYER 1 70%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 30%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-002	1st Floor Hall, Cementitious Ceiling Material/ Mastic					
WSC-57	Cementitious Material, Gray	LAYER 1 60%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 40%	None Detected		Fibrous Glass Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-003	1st Floor Hall, Cementitious Ceiling Material/ Mastic					
WSC-58	Cementitious Material, Gray	LAYER 1 30%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 70%	None Detected		Fibrous Glass Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type (%)	Non-Asbestos Components (%)
0132357-004 WSC-59	1st Floor Hall, Brown Pipe Insulation	LAYER 1 60%	None Detected	Fibrous Glass 40%
	Brown and Silver Jacket, Black Tar			Cellulose Fiber 40%
	Insulation, Orange	LAYER 2 40%	None Detected	Non-Fibrous Material 20%
		Asbestos Present: No	Total % Asbestos: No Asbestos Detected	
0132357-005 WSC-60	1st Floor Hall, Brown Pipe Insulation	LAYER 1 80%	None Detected	Fibrous Glass 40%
	Brown and Silver Jacket, Black Tar			Cellulose Fiber 40%
	Insulation, Orange	LAYER 2 20%	None Detected	Non-Fibrous Material 20%
		Asbestos Present: No	Total % Asbestos: No Asbestos Detected	
0132357-006 WSC-61	1st Floor Hall, Brown Pipe Insulation	LAYER 1 40%	None Detected	Fibrous Glass 40%
	Jacket, Brown and Silver			Cellulose Fiber 40%
	Insulation, Orange	LAYER 2 60%	None Detected	Non-Fibrous Material 20%
		Asbestos Present: No	Total % Asbestos: No Asbestos Detected	



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
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 Newport News VA 23602

MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-007 WSC-62	1st Floor, 12" Ceiling Tile	LAYER 1 100%	None Detected		Fibrous Glass	90%
	Orange Ceiling Tile, White Paint				Non-Fibrous Material	10%
		Asbestos Present:	No	Total % Asbestos:	No Asbestos Detected	
0132357-008 WSC-63	1st Floor, 12" Ceiling Tile	LAYER 1 100%	None Detected		Fibrous Glass	90%
	Orange Ceiling Tile, White Paint				Non-Fibrous Material	10%
		Asbestos Present:	No	Total % Asbestos:	No Asbestos Detected	
0132357-009 WSC-64	1st Floor, 12" Ceiling Tile	LAYER 1 100%	None Detected		Fibrous Glass	90%
	Ceiling Tile, Orange				Non-Fibrous Material	10%
		Asbestos Present:	No	Total % Asbestos:	No Asbestos Detected	
0132357-010 WSC-65	1st Floor, Heater Insulation	LAYER 1 30%	None Detected		Fibrous Glass	90%
	Plastic-Like Material and Paint, White				Non-Fibrous Material	10%
	Insulation, Orange	LAYER 2 70%	None Detected		Non-Fibrous Material	100%
		Asbestos Present:	No	Total % Asbestos:	No Asbestos Detected	



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-011 WSC-66	1st Floor, Heater Insulation Jacket, White	LAYER 1 50%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	40% 40% 20%
	Insulation, Orange	LAYER 2 50%	None Detected		Fibrous Glass Non-Fibrous Material	90% 10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-012 WSC-67	1st Floor, Heater Insulation Plastic-Like Material and Paint, White	LAYER 1 40%	None Detected		Non-Fibrous Material	100%
	Insulation, Orange	LAYER 2 60%	None Detected		Fibrous Glass Non-Fibrous Material	90% 10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-013 WSC-68	1st Floor, 2x4 Wormed Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
	Asbestos Present: No		Total % Asbestos:		No Asbestos Detected	



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
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MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-014 WSC-69	1st Floor, 2x4 Wormed Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-015 WSC-70	1st Floor, 2x4 Wormed Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-016 WSC-71	1st Floor, 2x4 Dotted Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-017 WSC-72	1st Floor, 2x4 Dotted Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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Plant Services - NNPS
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MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-018 WSC-73	1st Floor, 2x4 Dotted Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-019 WSC-74	1st Floor, 2x4 Pitted Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-020 WSC-75	1st Floor, 2x4 Pitted Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-021 WSC-76	1st Floor, 2x4 Pitted Ceiling Tile Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-022 WSC-77	1st Floor 303, 9" Ceiling Tile	LAYER 1 100%	None Detected		Cellulose Fiber	90%
	Orange Ceiling Tile, White Paint				Non-Fibrous Material	10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-023 WSC-78	1st Floor 303, 9" Ceiling Tile	LAYER 1 100%	None Detected		Cellulose Fiber	90%
	Orange Ceiling Tile, White Paint				Non-Fibrous Material	10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-024 WSC-79	1st Floor 303, 9" Ceiling Tile	LAYER 1 100%	None Detected		Cellulose Fiber	90%
	Orange Ceiling Tile, White Paint				Non-Fibrous Material	10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-025 WSC-80	1st Floor, Brick/ Mortar	LAYER 1 100%	None Detected		Cellulose Fiber	5%
	Gray Cementitious Material, White Paint				Non-Fibrous Material	95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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Plant Services - NNPS
 Attn: Pennie Robbins Boyack
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MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-026 WSC-81	1st Floor, Brick/ Mortar Gray Cementitious Material, White Paint	LAYER 1 100%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-027 WSC-82	1st Floor, Ceramic Wall Tile/ Blue Ceramic Tile, Blue	LAYER 1 100%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-028 WSC-83	1st Floor, Ceramic Wall Tile/ Blue Ceramic Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-029 WSC-84	1st Floor, Door Caulk Caulking and Paint, White	LAYER 1 100%	None Detected		Cellulose Fiber Wollastonite Non-Fibrous Material	5% 5% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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MCS Report No.: 0132357
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Customer PO No.:

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-030 WSC-85	1st Floor, Door Caulk Caulking and Paint, White	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-031 WSC-86	1st Floor, Window Caulk Caulking and Paint, White	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-032 WSC-87	1st Floor, Window Caulk Caulking, White	LAYER 1 100%	None Detected		Wollastonite Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-033 WSC-88	1st Floor, Drywall Brown Paper, White Paint	LAYER 1 40%	None Detected		Cellulose Fiber Non-Fibrous Material	90% 10%
	Drywall, White	LAYER 2 60%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Date Received: 03/08/2021
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Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-034 WSC-89	1st Floor, Drywall					
	Brown Paper, White Paint	LAYER 1 30%	None Detected		Cellulose Fiber Non-Fibrous Material	90% 10%
	Drywall, White	LAYER 2 70%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-035 WSC-90	1st Floor, Drywall					
	Brown Paper, White Paint	LAYER 1 30%	None Detected		Cellulose Fiber Non-Fibrous Material	90% 10%
	Drywall, White	LAYER 2 70%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-036 WSC-91	1st Floor Janitors, Pipe Insulation/ Patch					
	Red Jacket, White Paint	LAYER 1 60%	None Detected		Fibrous Glass Non-Fibrous Material	80% 20%
	Fibrous Material, Beige	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	90% 10%
	Insulation, Beige	LAYER 3 20%	Chrysotile	30%	Non-Fibrous Material	70%
Asbestos Present: Yes		Total % Asbestos:		6%		



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Date Sampled: 03/06/2021
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Job Location: Warwick Senior Center/ Gatewood Peep

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333.000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
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Date Received: 03/08/2021
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Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-037 WSC-92	1st Floor, 6" Black Base Cove/ Mastic					
	Cove Base, Black	LAYER 1 70%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Non-Fibrous Material	100%
	Wall Material, White	LAYER 3 10%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-038 WSC-93	1st Floor, 6" Black Base Cove/ Mastic					
	Cove Base, Black	LAYER 1 70%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Non-Fibrous Material	100%
	Wall Material, Beige	LAYER 3 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-039 WSC-94	1st Floor, 4" Brown Base Cove/ Mastic Cove Base, Brown	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Brown	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-040 WSC-95	1st Floor, 4" Brown Base Cove/ Mastic Cove Base, Brown	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Brown	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-041 WSC-96	1st Floor, 9" Red Tile/ Mastic Floor Tile, Red	LAYER 1 90%	Chrysotile	5%	Non-Fibrous Material	95%
	Mastic, Black	LAYER 2 10%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	10% 80%
Asbestos Present: Yes		Total % Asbestos:		6%		



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Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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Date Sampled: 03/06/2021
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Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-042 WSC-97	1st Floor, 9" Red Tile/ Mastic					
	Floor Tile, Red	LAYER 1 80%	Chrysotile	5%	Non-Fibrous Material	95%
	Mastic, Black	LAYER 2 20%	Chrysotile	5%	Cellulose Fiber Non-Fibrous Material	5% 90%
Asbestos Present: Yes		Total % Asbestos:		5%		
0132357-043 WSC-98	1st Floor, 9" Red Tile/ Mastic					
	Floor Tile, Red	LAYER 1 80%	Chrysotile	5%	Non-Fibrous Material	95%
	Mastic, Black	LAYER 2 20%	Chrysotile	5%	Cellulose Fiber Non-Fibrous Material	5% 90%
Asbestos Present: Yes		Total % Asbestos:		5%		
0132357-044 WSC-99	1st Floor, White/ Black Speckled Terrazzo					
	Floor Tile, White	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
	Asbestos Present: No		Total % Asbestos:		No Asbestos Detected	
0132357-045 WSC-100	1st Floor, White/ Black Speckled Terrazzo					
	Floor Tile, White	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
	Asbestos Present: No		Total % Asbestos:		No Asbestos Detected	



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
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	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-046 WSC-101	1st Floor, 12" Ivory Floor Tile/ Mastic Floor Tile, White	LAYER 1 70%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
	Flooring Material, Gray	LAYER 3 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-047 WSC-102	1st Floor, 12" Ivory Floor Tile/ Mastic Floor Tile, White	LAYER 1 70%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
	Flooring Material, Gray	LAYER 3 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
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REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-048 WSC-103	1st Floor, 12" Ivory Floor Tile/ Mastic Floor Tile, White	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Clear	LAYER 2 10%	None Detected		Cellulose Fiber	5%
					Non-Fibrous Material	95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132357-049 WSC-104	1st Floor, 12" White Floor Tile/ Mastic Floor Tile, White	LAYER 1 90%	Chrysotile	3%	Non-Fibrous Material	97%
	Mastic, Black	LAYER 2 10%	Chrysotile	10%	Cellulose Fiber	5%
					Non-Fibrous Material	85%
Asbestos Present: Yes		Total % Asbestos:		4%		
0132357-050 WSC-105	1st Floor, 12" White Floor Tile/ Mastic Floor Tile, White	LAYER 1 90%	Chrysotile	3%	Non-Fibrous Material	97%
	Mastic, Black	LAYER 2 10%	Chrysotile	10%	Cellulose Fiber	5%
					Non-Fibrous Material	85%
Asbestos Present: Yes		Total % Asbestos:		4%		



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Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

MCS Report No.: 0132357
Report Date: 03/23/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peep

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/18/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132357-051 WSC-106	1st Floor, 12" White Floor Tile/ Mastic Floor Tile, White	LAYER 1 90%	Chrysotile	3%	Non-Fibrous Material	97%
	Mastic, Black	LAYER 2 10%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
Asbestos Present: Yes			Total % Asbestos: 4%			

Analyst - Mary Helen Scott

Approved Signatory - Mary Helen Scott
 Laboratory Supervisor

Method Detection Limit: = <1%

- * Fiber concentrations were determined by visually estimating the area percentage for each type.
- * Asbestos fibers may not be detected by PLM in certain samples because of their size (<5um) or being bound with non-friable organic matrix. In such cases an alternative method of analysis may be necessary.
- * Analyzed only readily discernable layers.
- * All laboratory test results meet the applicable quality control requirements unless otherwise mentioned.
- * MCS, Inc. can not attest to nor be held responsible for the proper collection of samples and/or accuracy of the sample information provided by customers for samples not collected by MCS, Inc.
- * Test report relates only to the items tested.
- * The samples will be stored at the MCS, Inc. laboratory for a period of thirty days after the analysis. At the end of the period, it will be our policy to dispose of the samples unless prior arrangements have been made for a longer storage period.
- * This report shall not be reproduced, except in full, without the written approval of this laboratory.
- * The Report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the Federal Government.
- * The Report includes Chain of Custody.



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(757) 873-0933 • (757) 873-1074 (fax)

www.MarineChemist.com

Customer: NWPS
 Address: _____
 Email: Penny Boyack @ n.nj.v.a.us
 Attention: Penny Boyack
 Phone: 503-1192 Fax: _____
 MCS Job #: 21-0225 Customer PO: _____

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Warwick Senior Center / Governance peep

- Building Material
- Paint
- Soil
- Other

Requested Turnaround Time (markup)

- Same Day (100%)
- 1-Day (75%)
- 2-Day (50%)
- 3-Day (25%)
- 4-Day (12.5%)
- 5-Day (standard)

RESULTS DUE BY: 3-15-21

ANALYSIS: PCM

MCS Use Only

Special Instructions: _____

MCS Project Manager: _____

DO NOT MAIL Give Report To: _____

Email: _____ @ _____

MCS Lab Report No. 0132357 3/8/21 SGT

Samples Acceptable to Lab Yes No By _____

Date _____ If "No" Reason _____

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
WSC - 56	Senior Center 1 st floor Hall office	Cementitious ceiling material / mastic	0132357-001
WSC - 57	Senior Center 1 st floor Hall office	Cementitious ceiling material / mastic	0132357-002
WSC - 58	Senior Center 1 st floor Hall office	Cementitious ceiling material / mastic	0132357-003
WSC - 59	Senior Center 1 st floor Hall	Brown pipe insulation	0132357-004
WSC - 60	Senior Center 1 st floor Hall	Brown pipe insulation	0132357-005
WSC - 61	Senior Center 1 st floor Hall	Brown pipe insulation	0132357-006
WSC - 62	Senior Center 1 st floor	12" ceiling tile	0132357-007
WSC - 63	Senior Center 1 st floor	12" ceiling tile	0132357-008
WSC - 64	Senior Center 1 st floor	12" ceiling tile	0132357-009
WSC - 65	Senior Center 1 st floor	Heater insulation	0132357-010
WSC - 66	Senior Center 1 st floor	Heater insulation	0132357-011
WSC - 67	Senior Center 1 st floor	Heater insulation	0132357-012
WSC - 68	Senior Center 1 st floor	2x4 warped ceiling tile	0132357-013
WSC - 69	Senior Center 1 st floor	2x4 warped ceiling tile	0132357-014
WSC - 70	Senior Center 1 st floor	2x4 warped ceiling tile	0132357-015
WSC - 71	Senior Center 1 st floor	2x4 dented ceiling tile	0132357-016
WSC - 72	Senior Center 1 st floor	2x4 dented ceiling tile	0132357-017
WSC - 73	Senior Center 1 st floor	2x4 dented ceiling tile	0132357-018
WSC - 74	Senior Center 1 st floor	2x4 pitted ceiling tile	0132357-019
WSC - 75	Senior Center 1 st floor	2x4 pitted ceiling tile	0132357-020

Ryan Stanley
Sampled by (Print)

Ryan Stanley
Signature

3/6/21
Date/Time

OFFICE USE ONLY:

Ryan Stanley
Transported by (Print)

Ryan Stanley
Signature

3/6/21
Date/Time

Verbal _____

Sherrill Hillard
Received by (Print)

S. Hillard
Signature

3/8/21 835
Date/Time

Faxed _____

Copied _____

Emailed _____

(date and initial above areas)

Mailed Billing



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Customer: NMPD
 Address: _____
 Email: Pennie.Boyack@nmpd.virginia.gov
 Attention: Pennie Boyack
 Phone: 503-1142 Fax: _____
 MCS Job #: 21-0225 Customer PO: _____

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Warwick Senior Center / General pop

- Requested Turnaround Time (markup)
- | | |
|---|--|
| <input checked="" type="checkbox"/> Building Material | <input type="checkbox"/> Same Day (100%) |
| <input type="checkbox"/> Paint | <input type="checkbox"/> 1-Day (75%) |
| <input type="checkbox"/> Soil | <input type="checkbox"/> 2-Day (50%) |
| <input type="checkbox"/> Other | <input type="checkbox"/> 3-Day (25%) |
| | <input type="checkbox"/> 4-Day (12.5%) |
| | <input checked="" type="checkbox"/> 5-Day (standard) |

RESULTS DUE BY: 3-15-21
 ANALYSIS: FLM

MCS Use Only

Special Instructions: _____

MCS Project Manager: _____

DO NOT MAIL Give Report To: _____

Email: _____ @ _____

MCS Lab Report No. 0132357

Samples Acceptable to Lab Yes No By _____

Date _____ If "No" Reason _____

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
WSC - 76	Senior Center 1 st floor	2x4 ^{plaster} ceiling tile p	0132357-021
WSC - 77	Senior Center 1 st floor 303	9" ceiling tile	0132357-022
WSC - 78	Senior Center 1 st floor 303	9" ceiling tile	0132357-023
WSC - 79	Senior Center 1 st floor 303	9" ceiling tile	0132357-024
WSC - 80	Senior Center 1 st floor	Brick / Mortar	0132357-025
WSC - 81	Senior Center 1 st floor	Brick / mortar	0132357-026
WSC - 82	Senior Center 1 st floor	Ceramic wall tile / Blue	0132357-027
WSC - 83	Senior Center 1 st floor	Ceramic wall tile / Blue	0132357-028
WSC - 84	Senior Center 1 st floor	door caulk	0132357-029
WSC - 85	Senior Center 1 st floor	door caulk	0132357-030
WSC - 86	Senior Center 1 st floor	window caulk	0132357-031
WSC - 87	Senior Center 1 st floor	window caulk	0132357-032
WSC - 88	Senior Center 1 st floor	Drywall	0132357-033
WSC - 89	Senior Center 1 st floor	Drywall	0132357-034
WSC - 90	Senior Center 1 st floor	Drywall	0132357-035
WSC - 91	Senior Center 1 st floor Venters	pipe insulation / patch	0132357-036
WSC - 92	Senior Center 1 st floor	6" black base coat / mastic	0132357-037
WSC - 93	Senior Center 1 st floor	6" black base coat / mastic	0132357-038
WSC - 94	Senior Center 1 st floor	4" brown base coat / mastic	0132357-039
WSC - 95	Senior Center 1 st floor	4" brown base coat / mastic	0132357-040

Ryan Stanley
 Sampled by (Print)

Ryan Stanley
 Transported by (Print)

Shirley Hollander
 Received by (Print)

Ryan Stanley
 Signature

Ryan Stanley
 Signature

S. Hollander
 Signature

3/6/21
 Date/Time

3/6/21
 Date/Time

3/8/21
 Date/Time

OFFICE USE ONLY:

Verbal _____

Faxed _____

Copied _____

Emailed _____

(date and initial above areas)

Mailed Billing



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 (757) 873-0933 • (757) 873-1074 (fax)
 www.MarineChemist.com

Customer: UNPS
 Address: _____
 Email: Penny Bayach @ n.n. n12, va .us
 Attention: Penny Bayach
 Phone: 503-1192 Fax: _____
 MCS Job #: 21-022 S Customer PO: _____

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Warrick Senior Center / Gateval peeps

- Requested Turnaround Time (markup)
- | | |
|---|--|
| <input checked="" type="checkbox"/> Building Material | <input type="checkbox"/> Same Day (100%) |
| <input type="checkbox"/> Paint | <input type="checkbox"/> 1-Day (75%) |
| <input type="checkbox"/> Soil | <input type="checkbox"/> 2-Day (50%) |
| <input type="checkbox"/> Other | <input type="checkbox"/> 3-Day (25%) |
| | <input type="checkbox"/> 4-Day (12.5%) |
| | <input checked="" type="checkbox"/> 5-Day (standard) |

RESULTS DUE BY: 3-15-21
 ANALYSIS: PLM

MCS Use Only

Special Instructions: _____

MCS Project Manager: _____

DO NOT MAIL Give Report To: _____

Email: _____ @ _____

MCS Lab Report No. 0132357

Samples Acceptable to Lab Yes No By _____

Date _____ If "No" Reason _____

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
WSC-96	Senior Center 1 st floor	9" Red tile / mastic	0132357-041
WSC-97	Senior Center 1 st floor	9" Red tile / mastic	0132357-042
WSC-98	Senior Center 1 st floor	9" Red tile / mastic	0132357-043
WSC-99	Senior Center 1 st floor	white / black speckled terrazzo	0132357-044
WSC-100	Senior Center 1 st floor	white / black speckled terrazzo	0132357-045
WSC-101	Senior Center 1 st floor	12" Ivory floor tile / mastic	0132357-046
WSC-102	Senior Center 1 st floor	12" Ivory floor tile / mastic	0132357-047
WSC-103	Senior Center 1 st floor	12" Ivory floor tile / mastic	0132357-048
WSC-104	Senior Center 1 st floor	12" white floor tile / mastic	0132357-049
WSC-105	Senior Center 1 st floor	12" white floor tile / mastic	0132357-050
WSC-106	Senior Center 1 st floor	12" white floor tile / mastic	0132357-051

Ryan Stanley
 Sampled by (Print)

Ryan Stanley
 Transported by (Print)

Shirley Hollace
 Received by (Print)

Ryan Stanley
 Signature

Ryan Stanley
 Signature

S. Hollace
 Signature

3/6/21
 Date/Time

3/6/21
 Date/Time

3/8/21
 Date/Time

OFFICE USE ONLY:

Verbal _____

Faxed _____

Copied _____

Emailed _____

(date and initial above areas)

Mailed Billing



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 NEWPORT NEWS, VA 23606-2527
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 FAX: (757) 873-1074 · NORFOLK (757) 625-5696
www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-001	Gatewood Peeps, 12" Yellow Floor Tile/ Mastic					
GWP-1	Floor Tile, Beige	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	10%
					Non-Fibrous Material	90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-002	Gatewood Peeps, 12" Yellow Floor Tile/ Mastic					
GWP-2	Floor Tile, Beige	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	5%
					Non-Fibrous Material	95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-003	Gatewood Peeps, 12" Yellow Floor Tile/ Mastic					
GWP-3	Floor Tile, Beige	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	5%
					Non-Fibrous Material	95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



Marine Chemist Service, Inc.
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 FAX: (757) 873-1074 · NORFOLK (757) 625-5696
www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	Laboratory ID: 100551
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	Laboratory Code: 200628-0
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	Laboratory No: 460257
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	License No.: 3333 000004
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-004	Gatewood Peeps, 12" Orange Floor Tile/ Mastic					
GWP-4	Floor Tile, Yellow	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	5%
					Non-Fibrous Material	95%
	Asbestos Present: No	Total % Asbestos:	No Asbestos Detected			
0132358-005	Gatewood Peeps, 12" Orange Floor Tile/ Mastic					
GWP-5	Floor Tile, Yellow	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	5%
					Non-Fibrous Material	95%
	Flooring Material, Beige	LAYER 3 10%	None Detected		Non-Fibrous Material	100%
	Asbestos Present: No	Total % Asbestos:	No Asbestos Detected			



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www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-006	Gatewood Peeps, 12" Orange Floor Tile/ Mastic					
GWP-6	Floor Tile, Yellow	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	5%
	Flooring Material, Beige	LAYER 3 10%	None Detected		Non-Fibrous Material	95%
					Cellulose Fiber	5%
					Non-Fibrous Material	95%
	Asbestos Present: No	Total % Asbestos:	No Asbestos Detected			
0132358-007	Gatewood Peeps, 12" Red Floor Tile/ Mastic					
GWP-7	Floor Tile, Red	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber	5%
	Flooring Material, Gray	LAYER 3 10%	None Detected		Non-Fibrous Material	95%
					Cellulose Fiber	5%
					Wollastonite	5%
					Non-Fibrous Material	90%
	Asbestos Present: No	Total % Asbestos:	No Asbestos Detected			



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 FAX: (757) 873-1074 · NORFOLK (757) 625-5696
www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-008	Gatewood Peeps, 12" Red Floor Tile/ Mastic					
GWP-8	Floor Tile, Red	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-009	Gatewood Peeps, 12" Red Floor Tile/ Mastic					
GWP-9	Floor Tile, Red	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-010	Gatewood Peeps Left, 2x4 Wormed Ceiling Tile					
GWP-10	Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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 FAX: (757) 873-1074 · NORFOLK (757) 625-5696
www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	Laboratory ID: 100551
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	Laboratory Code: 200628-0
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	Laboratory No: 460257
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	License No.: 3333 000004
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-011	Gatewood Peeps Middle, 2x4 Wormed Ceiling Tile					
GWP-11	Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-012	Gatewood Peeps Right, 2x4 Wormed Ceiling Tile					
GWP-12	Ceiling Tile, Beige	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	30% 20% 50%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-013	Gatewood Peeps, Pipe Insulation					
GWP-13	Jacket and Paint, White	LAYER 1 30%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	40% 40% 20%
	Insulation, Yellow	LAYER 2 70%	None Detected		Fibrous Glass Non-Fibrous Material	90% 10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



Marine Chemist Service, Inc.
 11850 TUG BOAT LANE
 NEWPORT NEWS, VA 23606-2527
 TEL: (757) 873-0933 · NORFOLK (757) 640-1122
 FAX: (757) 873-1074 · NORFOLK (757) 625-5696
www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-014 GWP-14	Gatewood Peeps, Pipe Insulation Jacket, Beige	LAYER 1 40%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	40% 40% 20%
	Insulation, Yellow	LAYER 2 60%	None Detected		Fibrous Glass Non-Fibrous Material	90% 10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-015 GWP-15	Gatewood Peeps, Pipe Insulation Jacket, Beige	LAYER 1 20%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	40% 40% 20%
	Insulation, Yellow	LAYER 2 80%	None Detected		Fibrous Glass Non-Fibrous Material	90% 10%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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 FAX: (757) 873-1074 · NORFOLK (757) 625-5696
www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	Laboratory ID: 100551
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	Laboratory Code: 200628-0
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	Laboratory No: 460257
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	License No.: 3333 000004
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-016	Gatewood Peeps, Multi Colored Carpet/ Mastic					
GWP-16	Carpet, Purple	LAYER 1 50%	None Detected		Synthetic Fiber Non-Fibrous Material	80% 20%
	Backing, Gray	LAYER 2 40%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 3 10%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-017	Gatewood Peeps, Multi Colored Carpet/ Mastic					
GWP-17	Carpet, Purple	LAYER 1 50%	None Detected		Synthetic Fiber Non-Fibrous Material	80% 20%
	Backing, Gray	LAYER 2 40%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 3 10%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



Marine Chemist Service, Inc.

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www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-018	Gatewood Peeps, Multi Colored Carpet/ Mastic					
GWP-18	Carpet, Purple	LAYER 1 50%	None Detected		Synthetic Fiber Non-Fibrous Material	80% 20%
	Backing, Gray	LAYER 2 40%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 3 10%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-019	Gatewood Peeps, 4" Tan Base Cove/ Mastic					
GWP-19	Tan Cove Base, White Paint	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132358-020 GWP-20	Gatewood Peeps, 4" Tan Base Cove/ Mastic					
	Tan Cove Base, White Paint	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 10%	None Detected		Non-Fibrous Material	100%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-021 GWP-21	Gatewood Peeps, 4" Brown Base Cove/ Mastic					
	Cove Base, Brown	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Beige Mastic, White Paint	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	10% 90%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		
0132358-022 GWP-22	Gatewood Peeps, 4" Brown Base Cove/ Mastic					
	Cove Base, Brown	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Beige Mastic, White Paint	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	20% 80%
Asbestos Present: No		Total % Asbestos:		No Asbestos Detected		



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www.MarineChemist.com

Plant Services - NNPS
 Attn: Pennie Robbins Boyack
 12580 Patrick Henry Dr.
 Newport News VA 23602

Date Sampled: 03/06/2021
Sampled By: Ryan Stanley
Job Location: Warwick Senior Center/ Gatewood Peeps

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	Laboratory ID: 100551
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	Laboratory Code: 200628-0
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	Laboratory No: 460257
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	License No.: 3333 000004
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

MCS Report No.: 0132358
Report Date: 03/19/2021
MCS Job No.: 21-022S
Customer PO No.:

Date Received: 03/08/2021
Received By: SGH
Sample Matrix: BULK
Date Analyzed: 03/17/2021

Method of Analysis: Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
-----------------------------------	--------------------------------	----------------------	------------------	-----	----------------------------	-----

Mary Helen Scott
Analyst - Mary Helen Scott

Mary Helen Scott
Approved Signatory - Mary Helen Scott
 Laboratory Supervisor

- Method Detection Limit: = <1%
- Fiber concentrations were determined by visually estimating the area percentage for each type.
 - Asbestos fibers may not be detected by PLM in certain samples because of their size (<5um) or being bound with non-friable organic matrix. In such cases an alternative method of analysis may be necessary.
 - Analyzed only readily discernable layers.
 - All laboratory test results meet the applicable quality control requirements unless otherwise mentioned.
 - MCS, Inc. can not attest to nor be held responsible for the proper collection of samples and/or accuracy of the sample information provided by customers for samples not collected by MCS, Inc.
 - Test report relates only to the items tested.
 - The samples will be stored at the MCS, Inc. laboratory for a period of thirty days after the analysis. At the end of the period, it will be our policy to dispose of the samples unless prior arrangements have been made for a longer storage period.
 - This report shall not be reproduced, except in full, without the written approval of this laboratory.
 - The Report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the Federal Government.
 - The Report includes Chain of Custody.



Marine Chemist Service, Inc.

11850 Tug Boat Lane • Newport News, VA 23606

(757) 873-0933 • (757) 873-1074 (fax)

www.MarineChemist.com

Customer: NNPS

Address: _____

Email: Rene.Boyack@nn.kia.va.us

Attention: Rene Boyack

Phone: 503-1192 Fax: _____

MCS Job #: 21-0225 Customer PO: _____

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Gateward peeps / Warwick Senior Center

- Building Material
- Paint
- Soil
- Other _____

Requested Turnaround Time (markup)

- Same Day (100%)
- 1-Day (75%)
- 2-Day (50%)
- 3-Day (25%)
- 4-Day (12.5%)
- 5-Day (standard)

RESULTS DUE BY: 3-15-21

ANALYSIS: PLM

MCS Use Only

Special Instructions: _____

MCS Project Manager: _____

DO NOT MAIL Give Report To: _____

Email: _____ @ _____

MCS Lab Report No. 0132358 3/8/21 849

Samples Acceptable to Lab Yes No By _____

Date _____ If "No" Reason _____

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
GWP - 1	Gateward peeps	12" yellow floor tile / mastic	0132358-001
GWP - 2	Gateward peeps	12" yellow floor tile / mastic	0132358-002
GWP - 3	Gateward peeps	12" yellow floor tile / mastic	0132358-003
GWP - 4	Gateward peeps	12" orange floor tile / mastic	0132358-004
GWP - 5	Gateward peeps	12" orange floor tile / mastic	0132358-005
GWP - 6	Gateward peeps	12" orange floor tile / mastic	0132358-006
GWP - 7	Gateward peeps	12" red floor tile / mastic	0132358-007
GWP - 8	Gateward peeps	12" red floor tile / mastic	0132358-008
GWP - 9	Gateward peeps	12" red floor tile / mastic	0132358-009
GWP - 10	Gateward peeps (C)	2x4 worned ceiling tile	0132358-010
GWP - 11	Gateward peeps (m)	2x4 worned ceiling tile	0132358-011
GWP - 12	Gateward peeps (R)	2x4 worned ceiling tile	0132358-012
GWP - 13	Gateward peeps	pipe insulation	0132358-013
GWP - 14	Gateward peeps	pipe insulation	0132358-014
GWP - 15	Gateward peeps	pipe insulation	0132358-015
GWP - 16	Gateward peeps	multi colored carpet / mastic	0132358-016
GWP - 17	Gateward peeps	multi colored carpet / mastic	0132358-017
GWP - 18	Gateward peeps	multi colored carpet / mastic	0132358-018
GWP - 19	Gateward peeps	4" tan base coat / mastic	0132358-019
GWP - 20	Gateward peeps	4" tan base coat / mastic	0132358-020

Ryan Stanley
Sampled by (Print)

Ryan Stanley
Signature

3/6/21
Date/Time

OFFICE USE ONLY:

Ryan Stanley
Transported by (Print)

Ryan Stanley
Signature

3/6/21
Date/Time

Verbal _____

Shirlem Hollend
Received by (Print)

S. Hollend
Signature

3/8/21 849
Date/Time

Faxed _____

Copied _____

Emailed _____

(date and initial above areas)

Mailed Billing



Marine Chemist Service, Inc.
 11850 Tug Boat Lane • Newport News, VA 23606
 (757) 873-0933 • (757) 873-1074 (fax)
 www.MarineChemist.com

Customer: NNPS Page 2 of 2
 Address: _____
 Email: Penie. Boyach@nn.k12.va.us
 Attention: Penie Boyach
 Phone: 503-1192 Fax: _____
 MCS Job #: 21-0225 Customer PO: _____

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Gateway Peeps / Warwick Senior Center

Requested Turnaround Time (markup)

<input checked="" type="checkbox"/>	Building Material	<input type="checkbox"/>	Same Day (100%)
<input type="checkbox"/>	Paint	<input type="checkbox"/>	1-Day (75%)
<input type="checkbox"/>	Soil	<input type="checkbox"/>	2-Day (50%)
<input type="checkbox"/>	Other _____	<input type="checkbox"/>	3-Day (25%)
		<input type="checkbox"/>	4-Day (12.5%)
		<input checked="" type="checkbox"/>	5-Day (standard)

RESULTS DUE BY: 3-15-21
 ANALYSIS: PLM

MCS Use Only

Special Instructions: _____

MCS Project Manager: _____

DO NOT MAIL Give Report To: _____

Email: _____ @ _____

MCS Lab Report No. 0132358

Samples Acceptable to Lab Yes No By _____

Date _____ If "No" Reason _____

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
GWP - 21	Gateway peeps	4" Brown base coat / mastic	0132358-021
GWP - 22	Gateway peeps	4" Brown base coat / mastic	0132358-022

Ryan Stanley Sampled by (Print)	Ryan Stanley Signature	3/6/21 Date/Time	OFFICE USE ONLY: Verbal _____ Faxed _____ Copied _____ Emailed _____ (date and initial above areas)
Ryan Stanley Transported by (Print)	Ryan Stanley Signature	3/6/21 Date/Time	
Sherene Holland Received by (Print)	S. Holland Signature	3/8/21 Date/Time	



Marine Chemist Service, Inc.

SECTION 7 Inspection Information

Inspection Information

The survey contractor for the inspection of Gatewood Peep / Warwick Senior Center, located in Newport News, Virginia is:

Marine Chemist Service, Inc.
11850 Tug Boat Lane
Newport News, Virginia 23606
www.MarineChemist.com

The team leader responsible for quality control coordination of inspection and adherence to inspection protocol is:

Patrick Studley - CIH
Marine Chemist Service, Inc.
11850 Tug Boat Lane
Newport News, Virginia 23606
PStudley@MarineChemist.com

The AIHA and NVLAP Accredited laboratory selected to analyze the bulk samples for asbestos content by PLM, using the "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (Appendix A to Subpart F in 40 CFR Part 763) is:

Marine Chemist Service, Inc.
Virginia Asbestos Analytical Laboratory License 3333 000004
11850 Tug Boat Lane
Newport News, Virginia 23606
(757) 873-0933

The inspectors who physically inspected the building and who have received EPA-Approved Training are:

Ryan Stanley
Virginia Asbestos Inspector License 3303 004642
RStanley@MarineChemist.com

Kallie Brown
Virginia Asbestos Inspector License 3303 004704
KBrown@MarineChemist.com

Tiffany Turner
Virginia Asbestos Inspector License 3303 004542
TTurner@MarineChemist.com

Christopher Studley
Virginia Asbestos Inspector License 3303 4660
CStudley@MarineChemist.com

The Industrial Hygiene Inspectors are employed by:

Marine Chemist Service, Inc.
11850 Tug Boat Lane
Newport News, Virginia 23606



Marine Chemist Service, Inc.

SECTION 8 Credentials

Name STANLEY, RYAN KADE
License Number 3303004642
License Description Asbestos Inspector License
Rank Asbestos Inspector
Address NEWPORT NEWS, VA 23608
Initial Certification Date 2020-02-28
Expiration Date 2022-02-28

License Details

Name BROWN, KALLIE FLAXINGTON
License Number 3303004704
License Description Asbestos Inspector License
Rank Asbestos Inspector
Address NORFOLK, VA 23507
Initial Certification Date 2020-12-23
Expiration Date 2021-12-31

COMMONWEALTH of VIRGINIA
 Department of Professional and Occupational Regulation
 9960 Mayland Drive, Suite 400, Richmond, VA 23233
 Telephone: (804) 367-8500

EXPIRES ON 06-30-2021

NUMBER 3303004542

BOARD FOR ASBESTOS, LEAD, AND HOME INSPECTORS
 ASBESTOS INSPECTOR LICENSE

TIFFANY ANNE TURNER
 11850 TUG BOAT LANE
 NEWPORT NEWS, VA 23606

Maya Benjamine
 MAYA BENJAMINE, Director

Status can be verified at <http://www.dpor.virginia.gov>

(SEE REVERSE SIDE FOR PRIVILEGES AND INSTRUCTIONS) DPOR-LIC (02/2017)

COMMONWEALTH of VIRGINIA
 Department of Professional and Occupational Regulation
 9960 Mayland Drive, Suite 400, Richmond, VA 23233
 Telephone: (804) 367-8500

EXPIRES ON 06-30-2021

NUMBER 3303004669

BOARD FOR ASBESTOS, LEAD, AND HOME INSPECTORS
 ASBESTOS INSPECTOR LICENSE

CHRISTOPHER D STUDLEY
 11850 TUG BOAT LN
 NEWPORT NEWS, VA 23606

Maya Benjamine
 MAYA BENJAMINE, Director

Status can be verified at <http://www.dpor.virginia.gov>

(SEE REVERSE SIDE FOR PRIVILEGES AND INSTRUCTIONS) DPOR-LIC (02/2017)

COMMONWEALTH of VIRGINIA
 Department of Professional and Occupational Regulation
 9960 Mayland Drive, Suite 400, Richmond, VA 23233
 Telephone: (804) 367-8500

EXPIRES ON 08-31-2021

NUMBER 3333000004

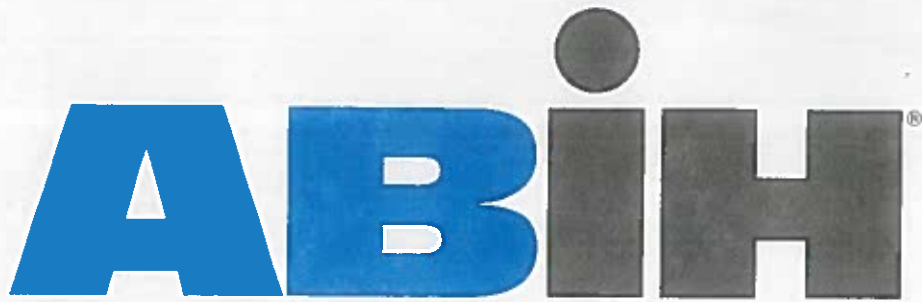
BOARD FOR ASBESTOS, LEAD, AND HOME INSPECTORS
 ASBESTOS ANALYTICAL LABORATORY LICENSE
 PCM PLM

MARINE CHEMIST SERVICE INC
 11850 TUG BOAT LANE
 NEWPORT NEWS, VA 23606-0000

Maya Benjamine
 MAYA BENJAMINE, Director

Status can be verified at <http://www.dpor.virginia.gov>

(SEE REVERSE SIDE FOR PRIVILEGES AND INSTRUCTIONS) DPOR-LIC (02/2017)



american board of industrial hygiene®

**organized to improve the practice of industrial hygiene
proclaims that**

Patrick Gene Studley

**having met all requirements of
education, experience and examination,
is hereby certified in the**

**COMPREHENSIVE PRACTICE
of
INDUSTRIAL HYGIENE**

and has the right to use the designations

CERTIFIED INDUSTRIAL HYGIENIST

CIH



Certificate Number	11321 CP
Awarded:	May 31, 2017
Expiration Date:	December 1, 2022



Chair, ABIH



Chief Executive Officer, ABIH





Marine Chemist Service, Inc.

This Page May Be Removed Prior to Bid Submittal

<u>ASBESTOS CONTAINING MATERIALS</u>	<u>QUANTITY</u>	<u>COST PER UNIT</u>	<u>REMOVAL COST</u>
Mastic under 12" Pinkish-Brown w/ Dark Speckled Floor Tile (Women's Room)	500 Sq. Ft.	\$4.25	\$2,125.00
12" Tan w/ Dark Brown Speckled Floor Tile/ Mastic (Women's Room, Room 408, 400A)	600 Sq. Ft.	\$4.25	\$2,550.00
Mastic under 12" Light Gray w/ Gray Speckled Floor Tile (Room 400A)	100 Sq. Ft.	\$4.25	\$425.00
Interior Window Glaze (Room 409A)	100 Lin Ft.	\$5.50	\$550.00
Sink Undercoating (Room 408)	1 Sink	\$150.00	\$150.00
Beige Pipe Insulation (1 st Floor Senior Center Janitor's Room)	20 Lin. Ft.	\$15.00	\$300.00
9" Red Tile and Mastic (1 st Floor Senior Center Janitor's Room)	75 Sq. Ft.	\$4.25	\$318.75
12" White Floor Tile and Mastic (1st Floor Senior Center Clinic Bathroom)	240 Sq. Ft.	\$4.25	\$1,020.00
Total		\$7,438.75	

*The abatement contractor may require a mobilization fee of approximately \$1,600.00 in addition to removal costs. Prices may vary depending on volume of abatement that needs to be accomplished, difficulty of set up requirement, work hours, work days and accessibility of materials.

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SECTION 031000 - CONCRETE FORMING 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. Form-facing material for cast-in-place concrete.
 - 2. Shoring, bracing, and anchoring.

1.3 DEFINITIONS

- A. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference:
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction, movement, contraction, and isolation joints
 - c. Forms and form-removal limitations.
 - d. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following:
 - 1. Exposed surface form-facing material.
 - 2. Concealed surface form-facing material.
 - 3. Form ties.
 - 4. Waterstops.
 - 5. Form-release agent.
- B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.
 - 1. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.

- a. Location of construction joints is subject to approval of the Architect.
 2. Indicate location of waterstops.
 3. Indicate form liner layout and form line termination details.
 4. Indicate proposed schedule and sequence of stripping of forms,
- 1.6 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For testing and inspection agency.
 - B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance Criteria AC308.
 - C. Field quality-control reports.
 - D. Minutes of preinstallation conference.
- 1.7 QUALITY ASSURANCE
- A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
 1. Provide continuous, true, and smooth concrete surfaces.
 2. Furnish in largest practicable sizes to minimize number of joints.

3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

- a. Plywood, metal, or other approved panel materials.
- b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - 1) APA HDO (high-density overlay).
 - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
 - 3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
 - 4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

- 1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.4 RELATED MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

- 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- 2. Form release agent for form liners shall be acceptable to form liner manufacturer.

C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

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

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
 - 2. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips
 - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 3. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.
1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Protect exposed waterstops during progress of the Work.

3.4 REMOVING AND REUSING FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations. Curing and protection operations need to be maintained at unformed surfaces and applied at formed surfaces immediately after removal of forms, for the remainder of the curing period.
- B. Clean and repair surfaces of forms to be reused in the Work.
1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERALRELATED 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. Steel reinforcement bars.
 - 2. Welded-wire reinforcement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference:
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction contraction and isolation joints.
 - c. Steel-reinforcement installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of steel reinforcement.
 - 2. Bar supports.
- B. Shop Drawings: Comply with ACI SP-066:
 - 1. Include placing drawings that detail fabrication, bending, and placement.
 - 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Steel Reinforcement:

- a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
 - B. Field quality-control reports.
 - C. Minutes of preinstallation conference.
- 1.6 QUALITY ASSURANCE
- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage
 - 1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain

2.3 FABRICATING REINFORCEMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
 - 3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
 - 4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 SPECIAL INSPECTIONS

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports. Special Inspections shall be in accordance with Section 1705.3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.
- B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

- 1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
- 2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.3 DEFINITIONS

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

- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

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

- 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

- a. Contractor's superintendent.
- b. Independent testing agency responsible for concrete design mixtures.
- c. Ready-mix concrete manufacturer.
- d. Concrete Subcontractor.
- e. Special concrete finish Subcontractor.

- 2. Review the following:

- a. Special inspection and testing and inspecting agency procedures for field quality control.
- b. Construction joints, control joints, isolation joints, and joint-filler strips.

- c. Vapor-retarder installation.
- d. Anchor rod and anchorage device installation tolerances.
- e. Cold and hot weather concreting procedures.
- f. Concrete finishes and finishing.
- g. Curing procedures.
- h. Forms and form-removal limitations.
- i. Methods for achieving specified floor and slab flatness and levelness.
- j. Floor and slab flatness and levelness measurements.
- k. Concrete repair procedures.
- l. Concrete protection.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
6. Vapor retarders.
7. Curing materials.
8. Joint fillers.
9. Repair materials.
- 10.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
 - a. Amount of mixing water withheld and allowed to be added at project site is required to be included on the delivery ticket.
10. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
11. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
12. Intended placement method.
13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

- C. Shop Drawings:
 - 1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.
- D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
 - 1. Concrete Class designation.
 - 2. Location within Project.
 - 3. Exposure Class designation.
 - 4. Formed Surface Finish designation and final finish.
 - 5. Final finish for floors.
 - 6. Curing process.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installer: Include copies of applicable ACI certificates.
 - 2. Ready-mixed concrete manufacturer.
 - 3. Testing agency: Include copies of applicable ACI certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Curing compounds.
 - 4. Bonding agents.
 - 5. Adhesives.
 - 6. Vapor retarders.
 - 7. Joint-filler strips.
 - 8. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Portland cement.
 - 2. Fly ash.
 - 3. Slag cement.
- D. Research Reports:
 - 1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
 - 2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.
- E. Preconstruction Test Reports: For each mix design.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
 - 1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Field Quality Control Testing Agency Qualifications: An independent agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 - 1. Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Water-Cement ratio.
 - e. Seven-day compressive strength.
 - f. 28-day compressive strength.
 - g. Standard deviation.
 - h. ACI required compressive strength

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 2. When average high and low temperature is expected to fall below 40 deg F, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 3. Do not use frozen materials or materials containing ice or snow.
 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
 - a. Maintain forms, steel reinforcement, embedded items, and subgrade temperature less than 115 deg F.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Source Limitations:
1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
 2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
 3. Obtain aggregate from single source.
 4. Obtain each type of admixture from single source from single manufacturer.
- B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, gray.
 2. Fly Ash: ASTM C618, Class C or F.
 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
- C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
1. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
 2. Maximum Coarse-Aggregate Size: 1 inch nominal.
 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class C: ASTM E1745, Class C; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

- D. Curing Paper: Eight-feet- wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- E. Water: Potable or complying with ASTM C1602/C1602M.
- F. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
 - 1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.6 REPAIR MATERIALS

- A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 - 2. Slag Cement: 50 percent by mass.

- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.8 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete used for footings, walls, etc.
1. Minimum Compressive Strength: As indicated at 28 days.
 2. Slump Limit: Slump Limit: 5 inches, plus or minus 1 inch or 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 3. Air Content:
 - a. 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate
 4. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- B. Class B: Normal-weight concrete used for interior slabs-on-ground.
1. Minimum Compressive Strength As indicated at 28 days.
 2. Minimum Cementitious Materials Content: 470 lb/cu. yd
 3. Slump Limit: Slump Limit: 5 inches, plus or minus 1 inch or 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 4. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 5. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
1. Daily access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
1. If a section cannot be placed continuously, provide construction joints as indicated.
 2. Deposit concrete to avoid segregation.
 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

- a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces not exposed to public view.
2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/4 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view..
3. ACI 301 Surface Finish SF-3.0:
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/8 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class A.
 - e. Locations: Apply to concrete surfaces exposed to public view.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish:
 1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
 2. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
 3. Apply float finish to sur
 4. Apply float finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system when the total air content of concrete exceeds 3 percent.
 - a. Coordinate required final finish with Architect before application.
 - b. Comply with flatness and levelness tolerances for trowel-finished floors.
- C. Float and Fine-Broom Finish.
 1. Immediately after float finishing, while concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route
 2. Apply to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method when the total air content of concrete exceeds 3 percent.
 - a. Coordinate required final finish with Architect before application.
 - b. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- D. Trowel Finish:
 1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
 2. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance.
 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 4. Do not add water to concrete surface.
 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system, where the total air content of concrete is less than 3 percent.
 7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 - a. Curing Period: 10 days.
2. If forms remain during curing period, moist cure after loosening forms.
3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
 - a. Curing Period: 10 days typical, 28 days for surfaces to receive a polished concrete finish
2. Interior Concrete Floors:

- a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12-inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Curing Compound:
- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
- c. Floors to Receive Curing and Sealing Compound:
- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

- A. Conform to ACI 117.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to remain exposed with repair topping.

- a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
- a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
- a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 SPECIAL INSPECTIONS

- A. Special Inspections: engage a special inspector to perform field tests and inspections and prepare testing and inspection reports. Special Inspections shall be in accordance with Section 1705.3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.
- B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Special Inspector shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 2. Special Inspector shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Special Inspector shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

- a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
 1. Verification of use of required design mixture.
 2. Concrete placement, including conveying and depositing.
 3. Curing procedures and maintenance of curing temperature.
 4. Post-installed anchors in hardened concrete.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure six 6-inch by 12-inch or 4-inch by 8-inch standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of three specimens at 28 days. Maintain remainder of specimens in reserve for later testing if required.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
 9. 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.
 10. Additional Tests:
 - a. 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.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
 11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.14 PROTECTION

- A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION 033000

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SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete block.
- B. Clay facing brick.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Lintels.
- G. Accessories.

1.2 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- G. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- I. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
- J. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- K. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- L. ASTM C150/C150M - Standard Specification for Portland Cement.
- M. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- N. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale).
- O. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- P. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- Q. ASTM C476 - Standard Specification for Grout for Masonry.
- R. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- S. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- T. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.

- U. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.
- V. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar and masonry accessories.
- C. 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. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- E. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.
 - 1. Masonry units.
 - a. Include material test reports and certifications substantiating compliance with requirements.
 - b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 4. Grout mixes. Include description of type and proportions of ingredients.
 - 5. Reinforcing bars.
 - 6. Joint reinforcement.
 - 7. Anchors, ties, and metal accessories.
- F. Shop Drawings:
 - 1. 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.
 - 2. Flashing: Detail inside/outside corner units, sill and head conditions; end-dam conditions; base-of-wall, lintel and low roof-to-wall conditions; and other special applications.
- G. Mix Designs: For each type of mortar and grout.
 - 1. Include description of type and proportions of ingredients.
 - 2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- H. Coordinate with Construction Waste Management requirements.
- I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.
- J. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with hot-weather requirements.
- K. Temporary Bracing Plan:
 - 1. Provide a temporary bracing plan for the information-only of the Architect; plan to be submitted minimum two weeks prior to initiating masonry Work.

2. The bracing plan must be based on the Mason Contractors Association of America's Standard Practice for Bracing Masonry Walls Under Construction, and Masonry Wall Bracing Design Handbook, or another industry recognized standard.
3. Bracing plan must be reviewed by a Professional Structural Engineer licensed in the jurisdiction where project is located; Professional Structural Engineer to provide a letter certifying his review of the plan and acknowledgement of its completeness.
4. The bracing plan and Professional Structural Engineer's letter must indicate project conditions unique to any referenced standard and provide for the unique bracing required for those conditions.
5. Maintain one copy of any industry standard referenced within the plan, on project site.

1.4 QUALITY ASSURANCE

A. Masonry Contractor Qualification:

1. Engage a trade contractor with at least 10 years' experience in masonry construction of type and scope included in the construction documents.
2. Demonstrate experience by submitting to the Owner a list of at least 10 masonry projects of similar size, complexity, and scope.
3. Submit resumes of all key personnel that will be assigned to the Project; dedicate assigned personnel to the Project for the entire scope of Work.

B. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of Contract Documents.

1. Maintain one copy of each document on project site.

C. Fire-Resistance Ratings: Where indicated, provide materials identical to those assemblies with fire-resistance ratings conforming to the Standard Method for Determining Fire Resistance of Concrete and Masonry Assemblies, ACI 216.1-97/TMS-0216-07, National Concrete Masonry Association TEK 7-1A, and ASTM E-119, and acceptable to authorities having jurisdiction.

1. Certification of concrete masonry units for fire ratings must be provided by the National Concrete Masonry Association or qualified independent testing agency.
2. Provide Letter of Certification for aggregates used in mix design assuring compliance with ASTM C 33 and ASTM C 331.
3. Provide mix design and determined equivalent thickness, for units incorporating recycled content materials.

1.5 PRE-INSTALLATION MEETING

- ##### A. Convene one week before starting work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

- ##### A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- ##### B. Store masonry units, cementitious materials, and preblended, dry mortar mix 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.
- ##### C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.7 ENVIRONMENTAL REQUIREMENTS

- ##### 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 and hold cover securely in place.

2. Where 1 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.
 3. Verify masonry protection at end of each day; inadequate protection by the trade contractor to be corrected or replaced by the Contractor, for proper protection; costs incurred by the Contractor is not the Owner's responsibility, but may be recovered under agreement with trade contractor.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
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 and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 2. Special Shapes:
 - a. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - b. Provide bullnose units for outside corners, unless otherwise indicated.
 - c. Bullnose units are not to be used at areas scheduled to be covered with tile.
 3. Load-Bearing Units: ASTM C90, normal weight.
 4. Non-Loadbearing Units: ASTM C129.

2.2 BRICK UNITS

- A. Acceptable Manufacturers:
1. Glen-Gery, Lawrenceville Brick, Old Richmond Modular.
 2. Triangle Brick, Flashed Wirecut, Product Number 1630, Merry Oaks plant.
- B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
1. Nominal size: Modular; 3-5/8 inches thick by 2-1/4 inches high by 7-5/8 inches long unless indicated otherwise.
 2. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Packaged blend of portland cement complying with ASTM C 150, Type II/I or Type III, and hydrated lime.

1. Not more than 0.60 percent alkali.
 2. Hydrated Lime: ASTM C207, Type S.
 3. Mortar Aggregate: ASTM C144.
 4. Grout Aggregate: ASTM C404.
- C. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
1. Color(s): As selected by Architect from manufacturer's full range.
 2. Manufacturers:
 - a. Davis Colors, a division of Venator Materials PLC: www.daviscolors.com.
 - b. Lambert Corporation: www.lambertusa.com.
 - c. Solomon Colors: www.solomoncolors.com.
 - d. ESSROC Cement Corp.; Flamingo.
 - e. Lehigh Cement Company.
- D. Admixtures: Permitted for cold- and hot-weather masonry work as permitted by referenced standards; non-chloride types.
- E. Water: Clean and potable.

2.4 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
1. Hohmann & Barnard, Inc: www.h-b.com.
 2. AA Wire Products Co.
 3. Dur-O-Wal: www.dur-o-wal.com.
 4. Heckman Building Products, Inc.
 5. WIRE-BOND www.wirebond.com.
 6. National Wire Products Industries.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; galvanized.
1. Recycled Content: Provide steel with minimum 90 percent total recycled content, including at least 60 percent post-consumer recycled content.
 2. Regional Materials: Provide at least 75 percent of steel manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.
- C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Ladder.
 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- D. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Ladder, with adjustable ties or tabs spaced at 16 in on center.
 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
 3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
 4. Vertical adjustment: Not less than 2 inches.
 5. Fabricate so that loops are located at face of continuous insulation.
 6. Insulation Clips: Provide clips at tabs or ties designed to secure continuous insulation in contact with backup construction.
 7. Manufacturers:
 - a. Hohmann & Barnard, Inc.; Product 280 Dub'l Loop-Lok Ladder with Byna Lok Wire Tie and Loop-Lok Washer: www.h-b.com.

- b. WIRE-BOND; Product Ladder Adjustable Double Loop Tie with Lock Washers; www.wirebond.com.
- E. Joint Reinforcement - General:
- 1. Provide in lengths of not less than 10 feet.
 - 2. Provide with prefabricated corner and tee units of same design type, wire thickness and finish as adjoining joint reinforcement.
- F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
- 1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
- G. Masonry Veneer Anchors at Metal Stud Backup: 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:
- 1. Anchor plates: Designed for fastening to structural backup through sheathing by two fasteners.
 - 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.
 - b. Fabricate sheet metal anchor sections and other sheet metal parts from minimum 14 gage, steel sheet, galvanized after fabrication.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches.
 - 4. Manufacturers:
 - a. Hohmann & Barnard, Inc.; BL-407 Anchor with Wedge-Lok Insulation Washer.
 - b. Construction Tie Products; CTP Veneer Anchoring System with CTP Insulation Retainer Plate.
 - c. Wire Bond; 2407 Adjustable Veneer Anchor with insulation Lock Washer.
 - 5. Organic-Polymer-Coated, Steel Drill Screws:
 - a. Dril-Flex; Elco Industries, Inc.
 - b. Traxx; ITW-Buildex.
 - c. Triangle Fastener Company.
- H. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
- 1. Screw-Attached Masonry-Veneer Anchor for Concrete: Screw with alternating threads, sealing washer and flanged head with eye for wire tie, designed for insertion into concrete in pre-drilled holes. Provide barrel length to match thickness of insulation.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include:
 - 1) Heckmann Building Products Inc.; Pos-I-Tie with Triangle Wire Tie. (Basis-of-Design)
 - 2) Hohmann & Barnard, Inc.; 2-Seal Concrete Anchor with 2-Seal Byna-Lok Wire Tie.
 - 3) Wire-Bond; Tapcon Sure-Tie for Concrete and Wood.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.
 - 3. Insulation Retainer: Heckman Thermal-Grip Brick Tie Washer or equivalent of other named manufacturers and accepted by continuous insulation manufacturer instead of installation pins.

- I. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by ¼ inch thick by 24 inches long, with ends turned up 2 inches unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- J. Reinforcing Bar Positioners:
 - 1. Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells, or as indicated on Drawings. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated. Provide units at all reinforced walls.
 - 2. Manufacturers:
 - 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.
- K. Reinforcing Bar Couplers:
 - 1. Mechanical splice connectors capable of developing intension or compression at least 125 percent of the specified yield strength of the bar.
 - 2. Representative Product: BarSplice Products, Inc., Tapered Threaded Grip-Twist Series.

2.5 FLASHINGS

- A. Stainless Steel/Polymer Fabric Flashing: ASTM A240/A240M; 2 mil type 304, ASTM A167 stainless steel sheet bonded on one side to one sheet of polymer fabric.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc; Mighty-Flash Stainless Flashing: www.h-b.com.
 - b. York Manufacturing, Inc; Multi-Flash SS: www.yorkmfg.com.
 - c. Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing.
 - d. Prosoco, Inc.; R-Guard SS ThruWall
 - e. STS Coatings, Inc.; Gorilla Flash Stainless Fabric
 - f. TK Products, Inc.; TK TWF
 - 2. Primer: Manufacturers standard product recommended for the application
 - 3. Performance Requirements:
 - a. Tensile Strength: ASTM D412 Die; 100,000.
 - b. Puncture Resistance: ASTM E154; minimum 2,500 psi.
 - c. Membrane Thickness: .004 in.
 - d. Stainless Steel Thickness: .003 in.
 - e. Stainless Steel Type: Type 304.
 - 4. Accessories (Basis-of-Design):
 - a. Mastic/sealant: Basis-of-Design: York Manufacturing, Inc.; UniverSeal US100.
 - 1) Type: One part 100% solids, solvent-free formulated silyl-terminated polyether (STPE), ASTM C920-11, Type S, Grade NS, Class 50.
 - b. Outside corner and inside corner material; manufacturer's standard available units using:
 - 1) Stainless steel: 26 gauge stainless steel.
 - 2) Sealed watertight.
 - c. End Dam: Flashing manufacturers preformed end dams or shop fabricated units using:
 - 1) Stainless steel: 26 gauge stainless steel.
 - 2) Sealed watertight.

- d. Splice material: Basis-of-Design: York 304 SS by York; manufacturer's standard self-adhered metal material; material matching system material or use Multi-Flash Stainless Steel 6" lap piece and polyether sealant as a splice.
 - e. Termination Bar: Basis-of-Design: York T-96 termination bar; manufacturer's standard 1" composite material bar or a 1" 26 gauge stainless steel termination bar with sealant lip.
 - f. Weep vent protection: Basis-of-Design: York's Weep Armor; geotextile drainage fabric at least 12" in height.
 - g. Repair and other materials/accessories: Manufacturer's standard.
 - h. Fasteners: Domestic manufactured fastener types and sizes recommended by flashing manufacturer for intended use.
5. Flexible Stainless Steel Drainage Plane Flashing:
- a. Product: Flash-Vent Stainless Steel by York, complete with sealants, termination bars, splice material, stainless steel corners.
 - b. Characteristics:
 - 1) Provides continuous weep vent.
 - a) Selection of this option allows contractor to eliminate separate cavity drainage material; weep vent inserts in brick head joints are still required.
 - 2) Fire Resistant: Passes ASTM E84, Class A.
6. Flexible flashing will not extend beyond face of mortar joint at any time; where drip is indicated, drip to be provided by use of stainless steel drip plates.
- B. Stainless Steel Drip Plates:
- 1. Provide at all flexible flashing locations.
 - 2. Material: Minimum 26 gage stainless steel.
 - 3. Profile:
 - a. Provide with closed hemmed drip edge to extend past face of wall.
 - b. Provide vertical leg extending up backup wall minimum 2 inches.
 - c. Provide pitch in drip plate as indicated on Drawings.
 - d. Provide shop fabricated and welded inside and outside corner.
 - e. At lip brick profiles, match profile with step in drip plate.
 - 4. Flexible flashing will cover drip plate; cut flush with face of mortar joint.
 - 5. Provide 1/8 inch thick sealant tape between drip plate and steel structural member.
 - 6. Bond flexible flashing to drip plate as recommended by flexible flashing manufacturer; product selection to ensure against adhesive drool beyond face of brick.
 - 7. Backer rod and sealant to be provided under drip edge per Division 7, at locations protecting steel.
- C. Drip Plate Fasteners - CMU Backup: Use low-velocity powder actuated ballistic point fastener with pre-mounted washer; submit ICC-ES Evaluation Report under product data submittals indicating fastener selection appropriate for intended use.
- D. Drip Plate Fasteners - Stud Backup: Corrosion-resistant screws located at every stud line.
- E. Self-adhering Flashing Seam Tape:
- 1. Sheet Material: 40 mil membrane with DuPont Elvaloy Kee; pressure sensitive clear adhesive for full bond to stainless steel drip plate and backup construction.
 - 2. Conforms to ASTM D412, ASTM D2240, ASTM D624 Die C, and ASTM G154.
 - 3. Basis-of-Design Product: Flex-Flash 8-inch wide roll by Hohmann & Barnard, Inc.
- 2.6 ACCESSORIES
- A. Preformed Control Joints: Rubber material, width as required for depth of concrete masonry unit wall.

1. Sizing: Select product designed for 8- or 10-inch concrete masonry unit, extending depth of unit and providing sealant backup; sizing to eliminate need for backer rods.
- B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to fully fill depth of air space, and designed to prevent mortar droppings from clogging cavity vents and allow proper cavity drainage.
 1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
 - a. Manufacturers:
 - 1) Advanced Building Products, Inc; Mortar Break DT: www.advancedbuildingproducts.com.
 - 2) Mortar Net Solutions: www.mortarnet.com.
 - 3) York Manufacturing, Inc; Weep-Net: www.yorkmfg.com.
 - 4) Keene Building Products; Product Keenestone Cut 2".
 - 5) Hohmann and Barnard, Inc.; Product Mortar Trap.
- C. Cavity Vents:
 1. Type: Polyester mesh or cellular insect-resistant vents.
 - a. Locations: Flashing location at base of cavity wall construction.
 2. Color(s): As selected by Architect from manufacturer's full range.
 3. Manufacturers:
 - a. Advanced Building Products, Inc: www.advancedbuildingproducts.com.
 - b. CavClear/Archovations, Inc: www.cavclear.com.
 - c. Dur-O-Wal: www.dur-o-wal.com.
 - d. Hohmann & Barnard, Inc: www.h-b.com.
 - e. Mortar Net Solutions: www.mortarnet.com.
 - f. WIRE-BOND: www.wirebond.com.
- D. Cleaning Solution: Not harmful to masonry work or adjacent materials, as recommended by brick manufacturer.
- E. Compressible Joint Filler: Closed cell neoprene sponge; neoprene/SBR polymer complying to ASTM D1056, Grade 2A-1.
 1. Manufacturers:
 - a. Hohmann & Barnard, Inc.; Product NS: www.h-b.com.
 - b. Illinois Products Corporation; Product Neocell : www.illinoisproducts.com.
 - c. WIRE-BOND; Product Expansion Joint #3300: www.wirebond.com.

2.7 LINTELS

- A. Contractor Option: Contractor may choose either of the following for lintels in masonry openings (refer to structural drawings for where steel lintels are required):
 1. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.
 2. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as required and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.8 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C270, using the Property Specification.
 1. Masonry below grade and in contact with earth: Type M.
 2. Exterior, loadbearing masonry: Type S.
 3. Exterior, brick veneer: Type N.

4. Interior, loadbearing masonry: Type N, except reinforced masonry to be Type S.
 5. Interior, non-loadbearing masonry: Type O or Type N (Contractor's discretion).
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

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

3.3 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

3.4 INSTALLATION - GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- 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. Do not install cracked, broken or chipped masonry units for any location to be exposed in completed work; do not install cracked, broken or chipped masonry units exceeding ASTM allowances in work to remain concealed or within mechanical or electrical spaces.
- E. 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.
- F. 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.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 46.

3.5 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. 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.
- D. Concrete Masonry Units:
 1. Bond: Running.
 2. Coursing: One unit and one mortar joint to equal 8 inches.
 3. Mortar Joints: Concave.
- E. Brick Units:
 1. Bond: Running.
 2. Mortar Joints: Concave.

3.6 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- G. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied or bitumen dampproofing is applied.
- H. Pointing:
 1. During the tooling of joints, enlarge voids and holes, and completely fill with mortar.
 2. Point joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance.
 3. Prepare joints for sealant application, where indicated.
- I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated and flexible anchors.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.7 CAVITY VENTS

- A. Place cavity vents such that two consecutive vertical joints will include vent followed by a vertical joint without; repeat this placement for full length of application.
- B. Install vents in contact with flashing, full-width of head joint and uninterrupted by mortar.

3.8 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations indicated on Drawings and as recommended by manufacturer to prevent mortar droppings from blocking cavity vents.

3.9 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY AND CAVITY WALL MASONRY

- 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.
 - 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.
 - a. Reinforcement of this subparagraph is in addition to continuous reinforcement.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.
 - 1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated.
 - 2. Keep open space free of mortar and other rigid materials.

3.10 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Typical: Place masonry joint reinforcement in first and second horizontal joints above and below openings.
 - 1. Extend minimum 16 inches each side of opening.
 - 2. Modify placement where flashing occurs in joint; flashing takes precedent; joint reinforcement location adjusted as accepted by Architect.
- B. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 16 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- C. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.11 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width of openings and at least 4 inches into adjacent masonry at each end; turn up not less than 2 inches to form end dams.

2. Carry flashing across air space behind veneer and up face of backup construction at least 8 inches to form watertight pan; extend flashing into masonry backup minimum 1-3/4 inches; secure flashing at non-masonry construction with termination bar and seal.
 3. Remove or cover protrusions or sharp edges that could puncture flashings.
 4. Embed flashings in mortar joint; place flashing on sloping bed of fresh mortar and cover with fresh mortar
 5. Seal lapped seams of stainless steel drip plates with self-adhering flashing seam tape; stop self-adhering flashing seam tape 3/8 inch of brick face and extend over turned up edge 3 inches onto backup construction; center tape on overlapping edge.
 6. Seal lapped ends and penetrations of flashing with adhesive or sealant, as recommended by flashing manufacturer, before covering with mortar.
- B. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.
- C. Lap end joints of flashings at least 6 inches and seal watertight as recommended by flashing manufacturer.
- D. Cut flashing flush with face of mortar joint after masonry construction is complete and inspected.
- 3.12 GROUTED COMPONENTS
- A. Lap splices minimum bar diameters required by structural engineer.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.
- D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.
- 3.13 REINFORCED UNIT MASONRY INSTALLATION
- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary 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 48 inches.
- 3.14 CONTROL AND EXPANSION JOINTS
- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- 3.15 BUILT-IN WORK
- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. 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.
- E. Do not build into masonry construction organic materials that are subject to deterioration.

3.16 TOLERANCES

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

3.17 CUTTING AND FITTING

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

3.18 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.
- C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.
 - 1. Test three samples for each 5,000 square feet of wall or portion thereof; test one sample at 7 days and two at 28 days for each set.

3.19 REPAIRING WORK

- 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.

3.20 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.21 PROTECTION

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

END OF SECTION

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SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Shrinkage-resistant grout.

1.3 DEFINITIONS

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

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

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

1.6 ACTION SUBMITTALS

- A. Product Data:
 - 1. Structural-steel materials.
 - 2. High-strength, bolt-nut-washer assemblies.
 - 3. Shear stud connectors.
 - 4. Anchor rods.
 - 5. Threaded rods.
 - 6. Shop primer.
 - 7. Galvanized-steel primer.
 - 8. Etching cleaner.

9. Galvanized repair paint.
 10. Shrinkage-resistant grout.
- B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 2. Include embedment Drawings.
 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. .
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint, including the following:
1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand-critical welds.
- 1.7 INFORMATIONAL SUBMITTALS
- A. Welding certificates.
- B. Mill test reports for structural-steel materials, including chemical and physical properties.
- C. Product Test Reports: For the following:
1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength, bolt-nut-washer assemblies.
- D. Survey of existing conditions.
- E. Source quality-control reports.
- F. Field quality-control reports.
- 1.8 QUALITY ASSURANCE
- A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
1. ANSI/AISC 303.
 2. ANSI/AISC 341.
 3. ANSI/AISC 360.
 4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992/A992M
- B. Channels, Angles: ASTM A36/A36M.
- C. Plate and Bar: ASTM A36/A36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A563M, Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.4 RODS

- A. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

1. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.
2. Washers: ASTM F436 (ASTM F436M), Type 1, hardened carbon steel.
3. Finish: Plain.

B. Threaded Rods: ASTM A36/A36M.

1. Nuts: ASTM A63 (ASTM A563M) heavy-hex carbon steel.
2. Washers: ASTM F436 (ASTM F436M), Type 1, hardened
3. Finish: Plain.

2.5 PRIMER

A. Steel Primer:

1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26.

1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20] [ASTM A780/A780M.

2.6 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

- C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 3.

- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
 - 1. SSPC-SP 3.

- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Bearing Plates: Clean masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIR

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

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.

2. Verify weld materials and inspect welds.

3. Verify connection materials and inspect high-strength bolted connections.

- B. Testing Agency engage a qualified testing agency to perform tests and inspections.
1. Bolted Connections: Inspect[and test] bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
 - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

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. Roof deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Evaluation Reports: For steel deck.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.7 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

PART 2 - PRODUCTS

2.1 ROOF DECK

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 2. Deck Profile: As indicated.
 - 3. Profile Depth: As indicated.
 - 4. Design Uncoated-Steel Thickness: As indicated.
 - 5. Side Laps: Overlapped

2.2 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- C. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- D. Galvanizing Repair Paint: ASTM A780/A780M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions 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, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Locate deck bundles to prevent overloading of supporting members.
- C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 INSTALLATION OF ROOF DECK

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals indicated, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) minimum.

3.4 SPECIAL INSPECTIONS

- A. Special Inspections and tests shall be performed by the Special Inspector or Special Inspection Agency.

- B. Verification and inspection of metal deck construction shall be in accordance with Table 1705.2.2 of Virginia Construction Code 2018 , and as follows:
 - 1. Welding: Welding inspection shall be in compliance with AWS D1.1.
 - 2. Details: Perform an inspection of the steel decking to verify compliance with the details shown on the approved construction documents, such as layout, bearing and laps, quantity and spacing of welds and screws.
- C. Remove and replace work that does not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Rough hardware.
- B. Steel ladders.
- C. Loose bearing and leveling plates.
- D. Loose steel lintels.
- E. Shelf angles.
- F. Support angles for elevator door sills.
- G. Steel framing and supports for countertops.
- H. Steel framing and supports for mechanical and electrical equipment.
- I. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- J. Metal bollards.
- K. Elevator sump grates.

1.2 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (with March 2016 Errata).

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 SUBMITTALS

- A. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
 - 1. For installed products indicated to comply with design loads include structural analysis data and shop drawings signed by the qualified professional engineer responsible for their preparation.

- B. Samples representative of materials and finished products as may be requested by Architect.
- C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.
- E. Qualification data for professional engineer responsible for designing fabrications indicated to comply with specific design loads.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Metal Surfaces, General:
 - 1. For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
 - 2. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
 - 3. Recycled Content: Provide steel with at least 25 percent post-consumer recycled content.
 - 4. Regionals Materials: Provide at least 25 percent of steel manufactured and containing recycled raw materials recovered within 100 mile radius of project site.
 - 5. Domestic Origin: Consistent with the Maryland Annotated Code, Article 78A known as the "Buy American Steel" Act of the General Assembly of Maryland, Acts of 1978, provide steel manufactured in the United States of America.
- B. Steel Sections: ASTM A 36/A 36M.
- C. Steel Tubing: Product type (manufacturing method) and as follows:
 - 1. Cold-Formed Steel Tubing: ASTM A 500.
 - 2. Hot-Formed Steel Tubing: ASTM A 501.
 - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
- D. Plates: ASTM A283/A283M.
- E. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
 - 1. Galvanized finish for exterior installations and where indicated.
 - 2. Black finish elsewhere, unless otherwise indicated.
- F. Gray-Iron Castings: ASTM A 48, Class 30.
- G. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

- H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.2 MATERIALS - ALUMINUM

- A. General:
 - 1. Recycled Content: Give preference to aluminum with the highest recycled content feasible.
- B. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632 (ASTM B 632M) Pattern 1, alloy 6061-T6.

2.3 PAINT

- A. Shop Primer for Ferrous Metal - Interior Locations, Loose Lintels, Plates, etc.: Refer to Division 9 painting specifications.
- B. Shop Finish - Exterior Fabrications (Stairs, Ladders, Frames, etc):
 - 1. Prepare galvanized surfaces as required by paint manufacturer.
 - 2. Electrostatic application of epoxy powder primer with 375f minimum 15 minute duration heat cure for maximum corrosion protection.
 - 3. Immediate electrostatic application of TGIC polyester powder color coat while metal temperature is minimum of 300f and heat cure for minimum 10 minutes at 400f.
 - 4. This process provides an average of 8-10 mils total coating thickness.
 - 5. Color to be selected by Architect.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.
- D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.
- C. Machine Screws: ANSI B18.6.3.
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- F. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material - General: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material - Exposed exterior or in contact with ground: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).
- H. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

2.5 GROUT

- A. 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.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 1. Construction Grout; W. R. Bonsal Co.
 2. Sure-grip High Performance Grout; Dayton Superior Corp.
 3. Euco N-S Grout; Euclid Chemical Co.
 4. Crystex; L & M Construction Chemicals, Inc.
 5. Masterflow 928 and 713; Master Builders Technologies, Inc.
 6. Sealtight 588 Grout; W. R. Meadows, Inc.
 7. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.

2.6 FABRICATION

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 1. Temperature Change (Range): 120 deg F.
- D. Shear and punch metals cleanly and accurately; remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.

- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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.
- K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- M. Fabricate items with joints tightly fitted and secured.
- N. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- O. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.7 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.8 STEEL LADDERS

- A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3.
- B. Siderails: Continuous, steel, 1/2-by-2-1/2-inch flat bars, with eased edges, spaced 18 inches apart.
- C. Bar Rungs: 3/4-inch diameter steel bars, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. with welded or bolted steel brackets.
 - 1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
 - 2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.
- F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to the rung by a proprietary process.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Mebac, IKG Borden.

b. SLIP-NOT, W. S. Molnar Co.

G. Galvanize ladders, including brackets and fasteners, in the following locations:

1. Elevator pit.

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. Loose steel lintels and bottom/hung plates located in exterior walls to be hot-dipped galvanized.

2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 1. Equip units with integrally welded anchors; furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- C. Galvanize miscellaneous framing and supports in the following locations:
 1. Exterior locations.
 2. Interior locations where indicated.

2.12 FRAME AND GRATE FOR ELEVATOR SUMP

- A. Basis-of-Design: Model R-4810-C by Neenah Foundry Company.
- B. Frames and grates to be Gray Iron, Class 35.

2.13 PIPE BOLLARDS

- A. Provide Schedule 80 steel pipe of size and height indicated as detailed on the Drawings.
- B. Permanent Setting:
 1. Set posts in concrete to a depth of 3'-0"; footing diameter minimum 3 times post diameter.
 2. Fill posts completely with concrete and dome on top.
- C. Finish: Painted as specified in Division 9 "Exterior Painting."

2.14 FINISHES - STEEL AND IRON

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

2.15 FINISHES - ALUMINUM

- A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I Natural Anodized Finish (unless indicated otherwise): AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.16 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. 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 the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

- E. 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 SETTING LOOSE PLATES

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

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 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.
- B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

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SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Galvanized steel railings.
 - 2. Galvanized steel handrails.

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

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Fasteners.
 - 3. Post-installed anchors.
 - 4. Handrail brackets.
 - 5. Shop primer.
 - 6. Intermediate coats and topcoats.
 - 7. Bituminous paint.
 - 8. Nonshrink, nonmetallic grout.
 - 9. Metal finishes.
 - 10. Paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.
- E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated-design professional engineer and testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.

- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.
- F. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.
- B. 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.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 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: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Tubing: ASTM A500/A500M (cold formed).
- D. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- E. Plates, Shapes, and Bars: ASTM A36/A36M.
- F. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

- A. Fastener Materials:
 - 1. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
 - 2. Finish exposed fasteners to match appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 - 3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Cast stainless steel, center of handrail 3-1/4 inches from wall.
 - 1. Stainless Steel Handrail Bracket - Basis-of-Design: Wagner RB34130.4 Handrail Bracket or equal.
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- 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. Shop Primers: Provide primers that comply with Division 9 painting specifications.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

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. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.
 - 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water.
 - 1. Provide weep holes where water may accumulate.
 - 2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Welded Connections - Steel Railing and Guardrails: 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 Finish #1 welds; ornamental quality with no evidence of a welded joint
- H. Form changes in direction as follows:
 - 1. As detailed.
 - 2. By bending to smallest radius that will not result in distortion of railing member.
- I. 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.
- J. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- K. 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.
- L. 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 prevent bracket or fitting rotation and crushing of substrate.
- M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.

- N. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, 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 and as follows.
 - 1. Comply with SSPC-SP 16.
- D. Field paint galvanized railings with coatings specified in Section 09 96 00 "High Performance Coatings".

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 6. 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.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 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.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.3 ANCHORING POSTS

- A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- C. 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 post and bolt to metal supporting surfaces.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends, using nonwelded connections.
- C. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges 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.

3.5 REPAIR

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

3.6 CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

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 05 52 13

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof edge support blocking.
 - 2. Wood blocking, cants, and nailers.
 - 3. Wood furring and grounds.

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Shop Drawings: For roof edge support blocking, including the following:
 - 1. Plans, details and attachments to other work.
 - 2. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 3. Layout of fasteners, fastener types and other attachments necessary to meet performance requirements.
 - 4. Details of special conditions.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Power-driven fasteners.
 - 4. Post-installed anchors.
 - 5. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Roof Edge Support Blocking: Provide roof edge support blocking that withstands exposure to weather and induced movement without failure, rattling, leaking, or fastener disengagement due to defective fabrication, installation, or other defects in construction.
 - 1. SPRI Wind Design Standard: Design and install wood blocking for copings and roof edges capable of resisting the following design pressures:
 - a. Design Pressure: As indicated on Drawings.

2.2 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. Dress 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.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

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

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
1. Framing for raised platforms.
 2. Concealed blocking.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Roof edge support blocking.
 4. Cants.
 5. Furring.
 6. Grounds.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Hem-fir (north); NLGA.
 2. Mixed southern pine or southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:
1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Northern species, No. 2 Common grade; NLGA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Screws for Fastening to Metal Framing: ASTM C1002 (non-loadbearing framing locations) or ASTM C954 (locations with 20 gage or heavier framing), length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- C. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
- D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- F. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than **1-1/2 inches** wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

END OF SECTION 06 10 53

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SECTION 07 16 16 - CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Crystalline waterproofing.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and installation instructions.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For applicator.
- B. Product Certificates: For each type of waterproofing, patching, and plugging material.
- C. Product Test Reports: For each product formulation, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm experienced in applying crystalline waterproofing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and that employs workers trained and approved by manufacturer.

1.6 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions.
- B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.
- C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F or above during work and cure period, and space is well ventilated and kept free of water.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

- A. Crystalline Waterproofing: Prepackaged, proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and concrete unit masonry and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate; with properties complying with or exceeding the criteria specified below.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anti-Hydro International, Inc.; Hydro Cap.
 - b. Conproco Corp.; Super Seal.
 - c. Euclid Chemical; Hey'Di K-11.
 - d. Master Builders; MasterSeal 500.
 - e. Xypex Chemical Corporation; Xypex.
2. Water Permeability: Maximum zero for water at 30 feet when tested according to COE CRD-C 48.
3. Compressive Strength: Minimum 4000 psi at 28 days when tested according to ASTM C109/C109M.

2.2 ACCESSORY MATERIALS

- A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; and compatible with substrate and other materials indicated.
- B. Plugging Compound: Factory-premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); and compatible with substrate and other materials indicated.
- C. Water: Potable.

2.3 MIXES

- A. Crystalline Waterproofing: Add prepackaged dry ingredients to water according to manufacturer's written instructions. Mix together with mechanical mixer or by hand to required consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for suitable conditions where waterproofing is to be applied.
- B. Proceed with application only after unsatisfactory conditions have been corrected.
- C. Notify Architect in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions.
- B. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to ensure adequate ambient temperatures and ventilation conditions for application.
- C. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.
- D. Stop active water leaks with plugging compound.
- E. Repair damaged or unsatisfactory substrate with patching compound.
 1. At holes and cracks 1/16 inch wide or larger in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and minimum 1 inch deep. Fill reveal with patching compound flush with surface.
- F. Surface Preparation: Remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form-release agents to ensure that waterproofing bonds to surfaces.

1. Clean concrete surfaces according to ASTM D4258.
 - a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic acid solution according to ASTM D4260.
 - b. Smooth-Formed and Trowel-Finished Concrete: Prepare by mechanical abrading or abrasive-blast cleaning according to ASTM D4259.
2. Clean concrete unit masonry surfaces according to ASTM D4261.
 - a. Lightweight Concrete Unit Masonry: Etch with 10 percent muriatic acid solution or abrade surface by wire brushing. Remove acid residue until pH readings of water after rinse are not more than 1.0 pH lower or 2.0 pH higher than pH of water before rinse.
 - b. Medium- and Normal-Weight Concrete Unit Masonry: Sandblast or bushhammer to a depth of 1/16 inch.
3. Concrete Joints: Clean reveals.

3.3 INSTALLATION

- A. Comply with waterproofing manufacturer's written instructions for application and curing.
 1. Saturate surface with water for several hours and maintain damp condition until applying waterproofing. Remove standing water.
 2. Apply waterproofing to surfaces, and extend waterproofing onto adjacent surfaces as follows:
 - a. Onto columns integral with treated walls.
 - b. Onto interior nontreated walls intersecting exterior treated walls, for a distance of 24 inches for cast-in-place concrete and 48 inches for masonry.
 - c. Onto exterior walls and onto both exterior and interior columns, for a height of 12 inches, where floors, but not walls, are treated.
 - d. Onto every substrate in areas indicated for treatment, including pipe trenches, pipe chases, pits, sumps and similar offsets and features.
 3. Number of Coats: Number required for specified water permeability.
 4. Application Method: Apply to ensure that each coat fills voids and is in full contact with substrate or previous coat.
 5. Dampen surface between coats.
- B. Final Coat Finish: Smooth, brushed or spray textured.
- C. Curing: Moist-cure waterproofing for three days immediately after final coat has set, followed by air drying, unless otherwise recommended in writing by manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed application of waterproofing.
- B. Prepare field service representative reports.

END OF SECTION 07 16 16

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SECTION 07 21 00 - THERMAL INSULATION**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Extruded polystyrene foam-plastic board insulation.
2. Polyisocyanurate foam-plastic board insulation.
3. Mineral-wool blanket insulation.
4. Foam expansion insulation.

1.2 ACTION SUBMITTALS**A. Product Data: For the following:**

1. Extruded polystyrene foam-plastic board insulation.
2. Polyisocyanurate foam-plastic board insulation.
3. Mineral-wool blanket insulation.
4. Foam expansion insulation.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Research 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 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION**

- A. Recycled Content: Provide polystyrene insulation with minimum 20 percent recycled content.
- B. Thermal and acoustic insulation installed within the building interior: Comply with emissions requirements of CDPH Standard Test Method in Section 01 81 13.
- C. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Atlas Roofing Corporation.
 - b. Carlisle Coatings & Waterproofing Inc.
 - c. Firestone Building Products.
 - d. Hunter Panels.
 - e. Johns Manville; a Berkshire Hathaway company–.
 - f. Rmax, Inc.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 EXTRUDED POLYSTYRENE BOARD INSULATION

- A. Location: Below grade foundation.
- B. Extruded Polystyrene Board Insulation, Type VI, Drainage Panels: ASTM C578, Type VI, 40-psi minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.
 1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 2. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
- C. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 MINERAL-WOOL BLANKET INSULATION

- A. Recycled Content: Provide mineral wool insulation with minimum 75 percent recycled content.
- B. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; a Berkshire Hathaway company; TempControl Mineral Wool Batts (exterior stud cavities).
 - b. Rockwool International; COMFORTBATT (exterior stud cavities).
 - c. Thermafiber, Inc.; an Owens Corning company; FS-15 (exterior stud cavities).
 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.4 FOAM EXPANSION INSULATION

- A. Insulation for voids, cavities and irregularly shaped areas: Medium expansion polyurethane foam.
- B. Type: Low pressure (less than 2 psig) closed-cell polyurethane; manufactured to ASTM E-84, Class 1 fire-rated specifications.
- C. Characteristics: Made with renewable foaming materials, contains no formaldehyde, plumbing safe, water resistant, and safe around approved electrical insulations.
- D. Available manufacturers include Tiger Foam Insulation, Hilti, Versi-Foam Systems, or equivalent.

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. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesive.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.
 - 1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
 - 2. Press units firmly against inside substrates.
 - 3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 04 20 00 "Unit Masonry."

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.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. 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 07 21 00

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SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vapor-permeable, fluid-applied 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 applied to an opaque wall, including joints and junctions to abutting construction, to bridge and seal air leakage pathways and gaps; including all accessories necessary for a complete installation.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site no less than three weeks prior to work.
 - 1. Participants: Owner, Architect, Contractor, air barrier installer, air barrier manufacturer's representative, and installers whose work interfaces with or affects air barrier, including but not limited to installers of masonry, sheathing products, flashings, roofing, wall panel systems, curtainwall, storefront, doors, windows, and louvers.
 - 2. Agenda:
 - a. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Include review of penetrations, building deflection joints, and other construction affecting air barrier installation.
 - d. Review methods, procedures, and construction sequence for air barrier and related construction, including review of manufacturer's written product specifications and installation instructions.
 - e. Review requirements for coordination of air barrier with adjacent materials and construction.
 - f. Review substrate conditions and finishes required to comply with manufacturer's requirements for installation of air barrier including fastening and flatness of substrate.
- B. Air Barrier Manufacturer's Acceptance: Obtain manufacturer's acceptance of air barrier for intended use shown on Drawings and of compatibility of air barrier with all materials in contact with air barrier.
- C. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

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

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier assemblies.
 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 3. Include details of interfaces with other materials that form part of air barrier including, but not limited to, the following as applicable to this Project:
 - a. Connection of air barrier in walls to roof membrane.
 - b. Connection of air barrier in walls to air barrier in foundation.
 - c. Application of air barrier to seismic and expansion joints.
 - d. Application of air barrier to openings and penetrations by windows, storefront framing, curtain wall framing, door frames, piping, conduit, ducts, masonry ties, screws, bolts, and similar components and penetrations.
 - e. Application of air barrier to exterior wall construction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer. Include list of ABAA-certified installers and supervisors employed by installer, who work on Project.
 1. Submit evidence that Installer is currently accredited under ABAA Quality Assurance Program, including accreditation number for ABAA Certified Installers.
- B. Certifications:
 1. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
 2. Acceptance of Materials: Submit document from air-barrier manufacturer certifying acceptance of materials proposed for use with air barrier that are not specified in this Section.
 3. Substrate Compatibility: Submit document from air-barrier manufacturer certifying that air barrier system materials used to adhere air barrier to substrate are chemically compatible.
 4. ABAA Certification: Submit evidence that air barrier system complies with requirements of ABAA Quality Assurance program specified in Quality Assurance article in this Section.
- C. Product Test Reports: For each air-barrier assembly, submit documentation from an approved independent testing laboratory certifying compliance with the air leakage rates of the air barrier membrane assembly, including primary membrane, primer and sealants have been tested to meet ASTM E2357, ICC-AC 38, Class A flame spread index and smoke development per ASTM E-84.
- D. Field Quality-Control Reports: Submit test results from testing specified in Field Quality Control article in Part 3 of this Section.
- E. ABAA Registration: Provide registration letter from ABAA to document job has been registered with ABAA to be performed and monitored in accordance with the ABAA QAP.
- F. ABAA QAP Report: Submit copy of ABAA Quality Assurance Program Report.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

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 in writing 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. Provide minimum 5-year assembly warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

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

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to 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, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
 - 1. Movement/Control Joints: Provide air barrier assembly capable of accommodating movements of building and building materials, including providing expansion and control joints and applicable accessories required to accommodate these movements.
 - a. Provide air barrier assembly capable of withstanding combined design wind, fan, and stack pressures, positive and negative, on building envelope without damage or displacement and transferring loads to structure.
 - b. Provide air barrier assembly materials that do not displace adjacent materials and air barrier assembly materials under full load.
 - c. Provide air barrier assembly joined in airtight and flexible manner to air barrier materials incorporated into adjacent construction and that allows relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.
 - 2. Connections to Adjacent Materials: Provide connections to adjacent materials that prevent air leakage at following locations:
 - a. Foundation and walls, including penetrations, ties and anchors.
 - b. Walls, windows, curtain walls, storefronts, louvers and doors.
 - c. Different assemblies and fixed openings within those assemblies.
 - d. Wall and roof connections.
 - e. Floors/soffits over unconditioned space.
 - f. Walls, floor and roof across construction, control and expansion joints.
 - g. Walls, floors and roof to utility, pipe and duct penetrations.
 - h. Seismic and expansion joints.
 - i. All other potential air leakage pathways in building envelope.
- 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 E2357.

2.3 AIR BARRIERS, VAPOR PERMEABLE

- A. Vapor-Permeable Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 30 mils or thicker over smooth, void-free substrates.
1. Synthetic Polymer Type:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Carlisle Coatings & Waterproofing Inc.; Fire Resist Barritech VP.
 - 2) GCP Applied Technologies Inc.; Perm-A-Barrier VP or Perm-A-Barrier VP 20 LT.
 - 3) Henry Company; Air-Bloc All Weather.
 - 4) Tremco Incorporated; ExoAir 230.
 - 5) W.R. Meadows, Inc.; Air-Shield LMP.
 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 E2178.
 - b. Vapor Permeance: Minimum 10 perms; ASTM E96/E96M, Desiccant Method, Procedure A.
 - c. Ultimate Elongation: Minimum 200 percent; ASTM D412, Die C.
 - d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D4541.
 - e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - f. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.0250 inch thick, and Series 300 stainless-steel fasteners.
- D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc .
 - b. Pecora Corporation; Pecora XL-Span or Sil-Span.
 - c. The Dow Chemical Company; Dow Corning® 123 Silicone Seal.
 - d. Tremco Incorporated; Spectrem Simple Seal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D4263.
4. Verify that masonry joints are flush and completely filled with mortar.

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

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. 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.

- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply preformed silicone extrusion 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. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.
- H. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- I. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
 - 1. Vapor-Permeable, Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 30 mils, applied in one or more equal coats.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. ABAA Installer Testing and Audits: Cooperate with ABAA testing agency, allowing ABAA testing agency access to work areas and staging and notifying ABAA testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection by ABAA testing agency. Do not cover Work of this section until testing and inspection by ABAA testing agency has been completed and accepted.
 - 1. Cost of ABAA Testing and Audit: Arrange and pay for site inspections and testing by ABAA to verify conformance of air barrier with specified requirements, air barrier system manufacturer's installation instructions, and ABAA Site Quality Assurance Program.
 - 2. Extent of Audit and Testing: Provide audit and testing as follows:
 - a. Up to 10,000 sq. ft. (929 sq. m.): 1 audit/test.
 - b. 10,001 to 35,000 sq. ft. (929.1 to 3251.6 sq. m): 2 audits/tests.
 - c. 35,001 to 75,000 sq. ft. (3251.7 to 6967.7 sq. m.): 3 audits/tests.

- d. 75,001 to 125,000 sq. ft. (6967.78 to 11612.8 sq. m.): 4 audits/tests.
 - e. 125,001 to 200,000 sq. ft. (11612.9 to 18580.6 sq. m.): 5 audits/tests.
 - f. 200,001 sq. ft. (18580.7 sq. m.) and over: 6 audits/tests.
3. Reporting: Submit written audit/testing reports to Architect within 10 working days of date inspection and testing performed.
 4. Correction: If audit and testing reveals defects, promptly remove and replace defective air barriers at no additional cost to Owner.
- C. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- D. 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. Air-barrier dry film thickness.
 3. Adhesion tests.
 4. Continuous structural support of air-barrier system has been provided.
 5. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 6. Site conditions for application temperature and dryness of substrates have been maintained.
 7. Maximum exposure time of materials to UV deterioration has not been exceeded.
 8. Surfaces have been primed, if applicable.
 9. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 10. Termination mastic has been applied on cut edges.
 11. Strips and transition strips have been firmly adhered to substrate.
 12. Compatible materials have been used.
 13. Transitions at changes in direction and structural support at gaps have been provided.
 14. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 15. All penetrations have been sealed.
 16. Tests: Refer to schedule at end of this Section. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers or ASTM E1186, chamber depressurization using detection liquids.
 17. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E783.
 18. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D4541 for each 600 sq. ft. of installed air barrier or part thereof.
- E. 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.
- F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- G. Prepare test and inspection reports.
- ### 3.6 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 recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-

- barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
- 2. Protect 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 in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

3.7 FIELD TEST SCHEDULE

A. Field Quality Control Testing for Air Leakage:

Location/Test	Testing Standard	Description	Pass/Fail Criteria	Schedule and Type, Number of Tests
One location of System Window	ASTM E 783	Field air leakage testing	<0.09 cfm/sq.ft at 6.24 lbf/sq.ft.	Mock-Up, 10%, 50% and 90% completion: 1 test
5 locations: transitions to adjacent systems, field of air barrier penetrations	ASTM E 1186	Field air leakage tests for air barrier assembly		30%
Vertical and horizontal expansion joints, including transitions / changes in plane in EJ cover	ASTM E 1186	Field air and water leakage tests		Completion of system tests

- B. Refer to other sections of the Project manual for testing requirements of building enclosure components including, but not limited to, roofing, openings and glazing.

END OF SECTION 07 27 26

SECTION 07 52 16 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Styrene-butadiene-styrene (SBS)-modified bituminous membrane roofing with granular cap sheet.
2. Roof insulation.
3. Cover board.

1.2 DEFINITIONS

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

1.3 PREINSTALLATION MEETINGS

A. 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, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. 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.

1. For insulation and roof system component fasteners, include copy of SPRI's Directory of Roof Assemblies listing.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:

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

- C. Samples for Verification: For the following products:
 - 1. Cap Sheet: Samples of specified color.
- D. Wind Uplift Resistance Submittal: For roofing system indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer Certificates:
 - 1. Performance Requirement Certificate: Signed by roof membrane manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of complying with performance requirements.
 - 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- C. Product Test Reports: For roof membrane and insulation, tests performed by a qualified testing agency, indicating compliance with specified requirements.
- D. Evaluation Reports: For components of membrane roofing system, from ICC-ES.
- E. Field Test Reports:
 - 1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
- F. Field quality-control reports.
- G. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.
- B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is listed in SPRI's Directory of Roof Assemblies for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

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.
 - 1. Protect stored liquid material from direct sunlight.
 - 2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.

1. Store in a dry location.
 2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 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. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
 2. Warranty Period: 25 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, for the following warranty period:
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
1. Fire/Windstorm Classification: Class 1A-75.
- D. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system and shall be listed in SPRI's Directory of Roof Assemblies for roof assembly identical to that specified for this Project.
- E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency.
1. Identify products with appropriate markings of applicable testing agency.

- F. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated.
 - 1. Identify products with appropriate markings of applicable testing agency.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturer approved by roof membrane manufacturer.

2.3 BASE SHEET MATERIALS

- A. SBS-Modified Bitumen Polyester Mat Base Sheet: ASTM D6164/D6164M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with polyester fabric, smooth surfaced, suitable for cold adhesive or hot asphalt application method.

- 1. Products: Provide the following:
 - a. Soprema, Inc.; Sopralene 180 Sanded, two layers.

2.4 STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS CAP SHEET

- A. Smooth-Surfaced Roofing Cap Sheet: ASTM D6164/D6164M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with polyester fabric, suitable for cold adhesive or hot asphalt application method.

- 1. Products: Subject to compliance with requirements, provide the following:
 - a. Bitec, Inc; SPS-3H.

- B. Smooth-Surfaced Roofing Cap Sheet: ASTM D6164/D6164M, Type II, Grade S, SBS-modified asphalt sheet, reinforced with polyester fabric, suitable for torch application method.

- 1. Products: Subject to compliance with requirements, provide the following:
 - a. Ecology Commercial and Industrial Roofing Systems; ERS-575.

- C. Smooth-Surfaced Roofing Cap Sheet: ASTM D6162/D6162M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with a combination of polyester and fiberglass fabric, suitable for cold adhesive or hot asphalt application method.

- 1. Products: Subject to compliance with requirements, provide the following:
 - a. Soprema, Inc.; **[Soprastar Sanded] [Soprastar Sanded PPLAP]**.

- D. Smooth-Surfaced Roofing Cap Sheet: ASTM D6162/D6162M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with a combination of polyester and fiberglass fabric, suitable for torch application method.

- 1. Products: Subject to compliance with requirements, provide the following:
 - a. Soprema, Inc.; Soprastar Flam.

- E. Granule-Surfaced Roofing Cap Sheet: ASTM D6164/D6164M, Type I, Grade G, SBS-modified asphalt sheet, reinforced with polyester fabric, suitable for cold adhesive or hot asphalt application method.

- 1. Products: Provide the following:
 - a. Ecology Commercial and Industrial Roofing Systems; ERS-554 GR FR.
 - b. Soprema, Inc.; Sopralene 180 FR GR.

- 2. Granule Color: Ultra White.

2.5 BASE FLASHING SHEET MATERIALS

- A. Backer Sheet: ASTM D2626/D2626M, asphalt-saturated and -coated organic felt, dusted with fine mineral surfacing on both sides.

- B. Liquid Flashing System: Roof membrane manufacturer's standard one- or two-part moisture curing resin with low solvent content, consisting of a primer, flashing cement, and scrim.

2.6 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
 - 1. <Double click to insert sustainable design text for recycled content.>
- D. Cold-Applied Asphalt Adhesive: ASTM D3019, Type III, roof membrane manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive, specially formulated for compatibility and use with roofing membrane and base flashings.
- E. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- G. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve; color to match roof membrane.
- H. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.7 ROOF INSULATION

- A. General: Preformed roof insulation boards, manufactured or approved by roof membrane manufacturer, , approved for use in SPRI's Directory of Roof Assemblies listed roof assemblies.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 1. Products: Provide the following:
 - a. Soprema; SOPRA-ISO.
 - 2. Compressive Strength: 20 psi.
 - 3. Size: 48 by 48 inches
 - 4. Thickness: As indicated on the drawings.

2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
- D. Insulation Cant Strips: ASTM C728, perlite insulation board.

- E. Cover Board: Roofing manufacturer's recommended cover board to be installed over top layer of polyisocyanurate roofing insulation before roofing membrane is installed.
 - 1. SOPRABOARD by Soprema.

2.9 ASPHALT MATERIALS

- A. Asphalt Primer: ASTM D41/D41M.
- B. Roofing Asphalt: ASTM D312/D312M, Type III or IV as recommended by roofing system manufacturer for application.

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 cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."
- 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.
 - 1. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.
 - 1. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, SPRI's Directory of Roof Assemblies listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.
 - 1. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.
- D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified in Section 07 27 26 "Fluid-Applied Membrane Air Barriers."
- E. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 deg F.
- D. Installation Over Metal Decking:
 - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
 - a. 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.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
 - 1) Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
 - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
 - 2. Install upper layers of insulation, with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. Trim insulation, so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
 - 1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines, with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. Cut and fit cover board tight to nailers, projections, and penetrations.
 - 3. Adhere cover board to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

- a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
- B. Install sheathing paper over cover board and immediately beneath roof membrane.

3.6 INSTALLATION OF ROOFING MEMBRANE, GENERAL

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

3.7 INSTALLATION OF BASE SHEET

- A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.
- B. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches and 6 inches, respectively.
- C. Installation of Base Sheet:
 - 1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
 - 2. Extend roofing sheets over and terminate above cants.
 - 3. Install base sheet in a shingle fashion.
 - 4. Adhere to substrate in a uniform coating of cold-applied adhesive.
 - 5. Install base sheet without wrinkles, rears, and free from air pockets.
 - 6. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
 - a. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches.
 - b. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches.
 - c. Stagger end laps not less than 18 inches.
 - d. Heat weld end laps, leaving no voids.
 - e. Roll laps with a 20-pound roller.
 - 7. Repair tears and voids in laps and lapped seams not completely sealed.
 - 8. Apply pressure to the body of the base sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.
- D. Installation of Asphalt-Coated Fiberglass-Mat Base Sheet:
 - 1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
 - 2. Extend roofing sheets over and terminate above cants.
 - 3. Install base sheet in a shingle fashion.
 - 4. Adhere to substrate in a uniform coating of cold-applied adhesive.
 - 5. Install base sheet without wrinkles or tears, and free from air pockets.

6. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
 - a. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches.
 - b. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches.
 - c. Stagger end laps not less than 18 inches.
 - d. Completely bond and seal laps, leaving no voids.
7. Repair tears and voids in laps and lapped seams not completely sealed.

3.8 INSTALLATION OF INTERPLY SHEETS

- A. Install two ply sheets, starting at low point of roofing.
 1. Align ply sheets without stretching.
 2. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane.
 - a. Shingle in direction to shed water.
 3. Extend ply sheets over and terminate above cants.

3.9 INSTALLATION OF SBS-MODIFIED BITUMINOUS CAP SHEET

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

3.10 INSTALLATION OF FLASHING AND STRIPPING

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 2. Backer Sheet Application:

- a. Adhere backer sheet over roofing membrane at cants in cold-applied adhesive.
 - b. Seal all laps.
3. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
1. Seal top termination of base flashing.
- D. Install liquid flashing system according to manufacturer's recommendations.
1. Extend liquid flashing not less than 3 inches in all directions from edges of item being flashed.
 2. Embed granules, matching color of roof membrane, into wet compound.
- E. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.

3.11 FIELD QUALITY CONTROL

- A. Perform the following tests:
1. Infrared Thermography: Testing agency shall survey entire roof area using infrared color thermography according to ASTM C1153.
 - a. Perform tests before overlying construction is placed.
 - b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing, or by nuclear hydrogen detection testing.
 - c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - d. Testing agency shall prepare survey report of initial scan indicating locations of entrapped moisture if any.
 2. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Roofing system will be considered defective if it does not pass tests and inspections.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

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

- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.13 ROOFING INSTALLER'S WARRANTY

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

1. Owner: **<Insert name of Owner>**.
2. Address: **<Insert address>**.
3. Building Name/Type: **<Insert information>**.
4. Address: **<Insert address>**.
5. Area of Work: **<Insert information>**.
6. Acceptance Date: _____.
7. Warranty Period: **<Insert time>**.
8. Expiration Date: _____.

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

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

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

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 90 mph;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded

basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

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

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

END OF SECTION 07 52 16

SECTION 07 71 29 - MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aluminum roof expansion joints.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roof expansion joints.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
 - 3. Provide isometric drawings of intersections, terminations, changes in joint direction or planes, and transition to other expansion joint systems depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.
- C. Samples: For each exposed product and for each color specified, 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer of roofing membrane.

1.6 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof expansion joints that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ALUMINUM ROOF EXPANSION JOINTS

- A. Aluminum Roof Expansion Joint: Factory-fabricated, continuous, waterproof, joint cover; consisting of a formed or extruded metal cover secured to extruded aluminum frames, with water-resistant gasketing between cover and frames, and with provision for securing assembly to substrate and sealing assembly to roofing membrane or flashing.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Certainteed; FlintEdge Expansion Joints.
 - b. Hickman Edge Systems; PermaSpan Expansion Joints.
 - c. Metal Era; Perma-Tite Expansion Joints.
 2. Joint Movement Capability: Plus and minus 50 percent of joint size.
 3. Cover: Formed aluminum; thickness 0.050 inch.
 4. Corner, Intersection, and Transition Units: Provide factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints.
 5. Accessories: Provide splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation.
 6. Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the cover.
 - a. Thermal Insulation: Fill space above secondary seal with mineral-fiber blanket insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84.
 7. Fire Barrier: Manufacturer's standard fire barrier for fire-resistance-rated expansion joint system.
- B. Materials:
1. Aluminum: ASTM B209 for sheet and plate, ASTM B221 for extrusions; alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
 - a. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.
 - b. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Two-Coat Fluoropolymer: System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 - c. Aluminum Finish Color: As selected by Architect from manufacturer's full range.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
- B. Mineral-Fiber Blanket: ASTM C665.
- C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joint openings, substrates, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for handling and installing roof expansion joints.
 - 1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
 - 2. Install roof expansion joints true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 3. Provide for linear thermal expansion of roof-expansion-joint materials.
 - 4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
 - 5. Provide uniform, neat seams.
 - 6. Install roof expansion joints to fit substrates and to result in watertight performance.
- B. Directional Changes: Install factory-fabricated units at directional changes to provide continuous, uninterrupted, and watertight joints.
- C. Splices: Splice roof expansion joints to provide continuous, uninterrupted, and waterproof joints.
 - 1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.
- D. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

END OF SECTION 07 71 29

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Nonstaining silicone joint sealants.
 2. Urethane joint sealants.
 3. Mildew-resistant joint sealants.
 4. Butyl joint sealants.
 5. Latex joint sealants.
 6. Semi-rigid joint fillers.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product; identify each product consistent with Types used within this Section.
1. Sealant Products:
 - a. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - b. List of backing materials approved for use with the specific product.
 - c. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - d. Substrates the product should not be used on.
 - e. Substrates for which laboratory adhesion and/or compatibility testing is required.
 - f. Sample product warranty.
 - g. Certification by manufacturer indicating that product complies with specification requirements.
 2. Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- 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; designations must be consistent with Types used within this Section.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.
 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Installation Plan: Submit at least four weeks prior to start of installation.

- D. Field-Adhesion-Test Reports: For each sealant application tested.
- E. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.
- F. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Manufacturers' special warranties.
- B. Installer's special warranties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three ten years documented experience.
 - 1. Manufacturer must designate a representative authorized to prepare a manufacturer's certificate, indicating compatibility of materials intended for each application.
- B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- C. Installation Plan: Include schedule of sealed joints, including the following.
 - 1. Installation Log Form: Include the following data fields, with known information filled out.
 - a. Substrates.
 - b. Sealant used.
 - c. Stated movement capability of sealant.
 - d. Confirmation that primer was used.
 - e. Size and actual backing material used.
 - f. Date of installation.
 - g. Name of installer.
 - h. Actual joint width; provide space to indicate maximum and minimum width.
 - i. Actual joint depth to face of backing material at centerline of joint.
 - j. Air temperature.

1.7 MOCKUPS

- A. 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.

1.8 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.

1.9 WARRANTY

- A. General: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

- B. 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.
- C. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period:
 - a. Silicone Sealants: Twenty years from date of Substantial Completion for vertical applications.
 - b. Silicone sealants for horizontal applications and other sealant types: Five years from date of substantial Completion.
- D. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

- A. Prohibit Methylene chloride and perchloroethylene in sealants.
- B. Minimum movement joint width 1/4-inch; minimum non-moving joint 1/8-inch.
- C. Installer must use primer for exterior assembly applications, including interior face of exterior wall joints, regardless if the manufacturer may otherwise relieve the installer of primer use under conditions within acceptable parameters; installer will only be relieved of primer use when manufacturer documents the application to be non-compliant to tested assembly.
- D. 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.
- E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- G. Colors of Exposed Joint Sealants: Custom color to be provided by Architect or as director to match adjacent materials.

2.3 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.

- a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
- a. Joints between door, window, and other frames and adjacent construction.
 - b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
 - 1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings.
 - 2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - c. Other joints indicated below.
3. Do not seal the following types of joints.:
- a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.4 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.
- B. Type A - Nonstaining Silicone Sealant: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.; Silpruf NB.
 - b. Pecora Corporation; Pecora 890NST.
 - c. Sika Corporation; Joint Sealants; Sikasil WS-295.
 - d. The Dow Chemical Company; DOWSIL 795.
 - e. Tremco Incorporated; Spectrem 1.
 2. Joint Locations:
 - a. Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
 - b. Construction joints in cast-in-place concrete.
 - c. Joints between plant-precast architectural concrete units.
 - d. Control and expansion joints in unit masonry.
 - e. Openings below ledge angles in masonry.
 - f. Joints between metal panels.
 - g. Joints between different materials.
 - h. Perimeter joints between materials listed above and frames of doors, frames and louvers.
 - i. Control and expansion joints in soffits and other overhead surfaces.
 3. Interior joints.

- a. Control and expansion joints on exposed interior surfaces of exterior walls.
- b. Perimeter joints of exterior openings where indicated.

2.5 URETHANE JOINT SEALANTS

- A. Type B - Hybrid Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
 1. Movement Capability: Plus and minus 35 percent, minimum.
 2. Hardness Range: 20 to 40, Shore A, when tested in accordance with ASTM C661.
 3. Color: Match adjacent finished surfaces.
 4. Manufacturers:
 - a. Master Builder Solutions; MasterSeal NP 100.
 - b. Franklin International Inc; Titebond WeatherMaster ULTIMATE MP Sealant.
 - c. Sherwin-Williams Company; Stampede 100 Low-Modulus Hybrid Urethane Sealant.
 - d. Sherwin-Williams Company; Stampede 1H Hybrid Sealant.
 - e. Tremco Commercial Sealants and Waterproofing; Dymonic FC.
 5. Joint Locations: As indicated for Type A sealant; Contractor may use this type of sealant or Type A at their discretion - remain consistent throughout project.
- B. Type C - Non-Sag "Traffic-Grade" Polyurethane Sealant: Single or multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic-use, urethane joint sealant; ASTM C920, Grade NS, explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
 1. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
 2. Joint Locations: Interior joints in horizontal traffic surfaces.
- C. Type D - Self-Leveling Polyurethane Sealant: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Master Builder Solutions; MasterSeal SL 2 (Pre-2014: Sonolastic SL2) or SL 100.
 - b. The QUIKRETE Companies; QUIKRETE® Polyurethane Self-Leveling Sealant.
 - c. Sherwin-Williams Company (The); S-W Loxon SL2 Self-Leveling Smooth Polyurethane Sealant.
 - d. Sika Corporation; Joint Sealants; Sikaflex 2c SL.
 - e. Tremco Incorporated; THC 901 or Vulkem 445SSL.
 2. Joint Locations:
 - a. Exterior joints in horizontal traffic surfaces.
 - b. Exterior expansion joints in horizontal traffic surfaces.

2.6 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Type E - Mildew Resistant Silicone Sealant: Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
 - b. Pecora Corporation; Pecora 860.
 - c. The Dow Chemical Company; DOW CORNING® 786 SILICONE SEALANT -.

- d. Tremco Incorporated; Tremsil 200 Sanitary.
2. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints.
 - c. Other joints as indicated.
- 2.7 BUTYL JOINT SEALANTS
- A. Type F - Butyl-Rubber-Based Joint Sealants: ASTM C1311.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc; Chem-Calk 300.
 - b. Pecora Corporation; BC-158.
 2. Locations: Where indicated.
- 2.8 LATEX JOINT SEALANTS
- A. Type G - Acrylic Emulsion Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Master Builder Solutions; MasterSeal NP 520.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. Momentive Performance Materials; RCS 20 Siliconized Acrylic Sealant.
 - d. Pecora Corporation; AC-20.
 - e. Sherwin-Williams Company (The); S-W Sher-Max Ultra Acrylic Sealant.
 - f. Tremco Incorporated; Tremflex 834.
 2. Joint Locations: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
 - a. Vertical joints on exposed surfaces of interior unit masonry or concrete walls and partitions.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, lites and elevator entrances.
 - c. Exposed joints in sound rated construction and exposed flanking sound paths, to be painted.
- 2.9 SEMI-RIGID JOINT FILLERS
- A. Type H - Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
 1. Composition: Multi-component, 100 percent solids by weight.
 2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
 3. Color: Concrete gray.
 4. Joint Width, Minimum: 1/8 inch.
 5. Joint Width, Maximum: 1/4 inch.
 6. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.
 7. Manufacturers:
 - a. Master Builder Solutions; MasterSeal CR 190.
 - b. Dayton Superior Corporation; Pro-Poxy P606.
 - c. Euclid Chemical Company; EUCO 700.
 - d. Nox-Crete; DynaFlex 502.
 - e. W.R. Meadows, Inc; Rezi-Weld Flex.

- B. Type I - Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
 - 1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
 - 2. Color: Concrete gray.
 - 3. Joint Width, Minimum: 1/8 inch.
 - 4. Joint Width, Maximum: 3/4 inch.
 - 5. Joint Depth: Provide product suitable for joints from 1/8 inch to 1 inch in depth excluding space for backer rod.
 - 6. Manufacturers:
 - a. Adhesives Technology Corporation; Crackbond JF-311.
 - b. ARDEX Engineered Cements; ARDEX ARDISEAL RAPID PLUS.
 - c. Master Builder Solutions; MasterSeal CR 100.
 - d. Euclid Chemical Company; EUCO QWIKjoint UVR.
 - e. Nox-Crete; DynaFlex JF-85.
 - f. SpecChem, LLC; Rapid Flex CJ.

2.10 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 C1330; Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin). or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Open cell must remain dry at all times.
- 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.

2.11 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.
 - c. Unglazed surfaces of ceramic tile.
 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.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- 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 C1193 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 C1193 unless otherwise indicated.
- 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.

END OF SECTION 07 92 00

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SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. 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. Samples for Verification:
 - 1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
 - 2. Fabrication: Prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.

- b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- E. 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 - 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 - 3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly and thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.
- C. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.
- D. Field quality control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

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. Ceco Door; ASSA ABLOY.
 - 2. Curries Company; ASSA ABLOY.
 - 3. Custom Metal Products.
 - 4. DCI Hollow Metal.
 - 5. DE LA FONTAINE.
 - 6. Fleming Door Products Ltd.; Assa Abloy Group Company.
 - 7. Mesker Door Inc.
 - 8. Pioneer Industries.
 - 9. Republic Doors and Frames; Allegion Brand.
 - 10. Security Metal Products Corp.
 - 11. Steelcraft; Allegion Brand.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 - 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. Temperature-Rise Limit: Where indicated on Drawings and at vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- B. Fire-Rated, Borrowed-Lite Assemblies: 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.
- C. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.
 - 1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with NFRC 102 and/or ASTM C1363 and meet or exceed the following requirements:
 - a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.374, R-Value 2.53, including insulated door and thermal-break frame.
 - 2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with NFRC 400 and/or ASTM E283 to meet or exceed the following requirements:
 - a. Rate of leakage of the door assembly shall not exceed 0.1 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).
 - 3. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- D. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound or thermally-rated must comply with the requirements specified for exterior doors and for sound or thermally-rated doors; where two requirements conflict, comply with the most stringent.

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.
- B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A..
 - 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 0.053 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.

- f. Core: Vertical steel stiffener.
 - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated and temperature-rise-rated doors.
2. Frames:
- a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile 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. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. .
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 0.053 inch, with minimum A40 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Bevel lock and hinge edges 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 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: Polyisocyanurate.
 - i. Fire-Rated Core: Manufacturer's standard vertical steel stiffener with insulation 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: Kerf type; thermal break.
 - c. Thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400.
 - d. Fabricate with 1/16-inch positive thermal break and integral vinyl weatherstripping, matching tested assembly.
 - e. Fabricate with mitered corners; profile as indicated on drawings.
 - f. Metal: Minimum 0.081-inch (2.7-mm) thick steel sheet.
 - g. Products:
 - 1) Assa Abloy brands; Mercury Thermal Break TQB Series.
 - 2) DE LA FONTAINE; Thermal Break Profile.
 - 3) Fleming Door Products; TB Series Frames.
 - 4) Pioneer: Thermal Break Frames.
 - 5) Equivalent product of other manufacturers named within this Section.
3. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch.
- B. Construction: Full profile welded.

- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of 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.
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. 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 A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.7 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- 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 C665, 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 E136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.8 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. 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. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. 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.
- C. 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 ANSI/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.
- D. 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 beveled 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.

2.9 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 ANSI/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.

3.2 INSTALLATION

- A. 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 ANSI/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. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
 - C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 1. Non-Fire-Rated Steel Doors: Comply with ANSI/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 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
- 3.3 REPAIR
- 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.

END OF SECTION 08 11 13

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SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Door frame construction.
7. Factory-machining criteria.
8. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.
8. Requirements for veneer matching.
9. Doors to be factory finished and application requirements.
10. Apply AWI Quality Certification Program label to shop drawings.

C. Samples for Initial Selection: For factory-finished doors.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Special warranties.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
 - 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons, and wrap bundles of doors in plastic sheeting.
- C. Mark each door on bottom rail with opening number used on shop drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - c. 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 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated on Drawings and vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
- 2.2 FLUSH WOOD DOORS, GENERAL
- A. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.
1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.
- 2.3 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH
- A. Interior Doors:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eggers Industries.
 - b. Lambton Doors.
 - c. Masonite Architectural.
 - d. Oshkosh Door Company.
 - e. VT Industries Inc.
 2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
 3. Architectural Woodwork Standards Grade: Custom.
 4. Faces: Single-ply wood veneer not less than 1/50 inch thick.
 - a. Species: Match existing.
 - b. Cut: Match existing.
 - c. Match between Veneer Leaves: Book match.
 - d. Assembly of Veneer Leaves on Door Faces: Center-balance match.
 - e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - f. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
 - g. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
 5. Exposed Vertical and Top Edges: Same species as faces - Architectural Woodwork Standards edge Type A.
 - a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
 - b. Fire-Rated Pairs of Doors: 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.

- c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - 1) Screw-Holding Capability: 550 lbf in accordance with WDMA T.M. 10.
- 6. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, Grade LD-1 particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 - 2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 08 71 00 "Door Hardware."
- 7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
 - a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.
- 8. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit 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: Manufacturer's standard shape.
 - 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 - 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 - 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 - 5. Factory prepare doors receiving templated mortised and electric hardware in accordance with Door Hardware Schedule. Field modification of mortised and electric hardware not acceptable in accordance with NFPA 80, Section 4.1.3.
 - 6. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

2.6 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 2. Finish faces, all four edges, edges of cutouts, and mortises.
 3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 1. Architectural Woodwork Standards Grade: Custom.
 2. Finish: Architectural Woodwork Standards System-10, UV Curable, Water Based.
 3. Finish: ANSI/WDMA I.S. 1A TR-6 Catalyzed Polyurethane.
 4. Staining: Match existing.
 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Install frames level, plumb, true, and straight.
 1. Install fire-rated doors, in corresponding fire-rated frames, in accordance with NFPA 80.
 2. Install smoke- and draft-control doors in accordance with NFPA 105.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 00 - ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling access door and frame units.
- B. ITS (DIR) - Directory of Listed Products.
- C. UL (FRD) - Fire Resistance Directory.

1.2 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Material: Steel.

2.2 ACCESS DOORS AND PANELS

- A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
- B. Units in Fire Rated Assemblies: Fire rating equivalent to the fire rated assembly in which they are to be installed.
 - 1. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.

2.3 WALL AND CEILING MOUNTED UNITS

- A. Manufacturers:
 - 1. Activar Construction Products Group - JL Industries: www.activarcpg.com.
 - 2. ACUDOR Products Inc: www.acudor.com.
 - 3. Babcock-Davis: www.babcockdavis.com.
 - 4. Karp Associates, Inc: www.karpinc.com.
 - 5. Milcor, Inc: www.milcorinc.com.
 - 6. Nystrom, Inc: www.nystrom.com.
- B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Style: Recessed door panel for infill with wall/ceiling finish.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
 - 2. Frames: 16 gage, 0.0598 inch, minimum thickness.
 - 3. Single Steel Sheet Door Panels: 16 gage, 0.0598 inch, minimum thickness.
 - 4. Door Panels to Receive Wall/Ceiling Finish: Surface recessed 5/8 inch back from wall face.

5. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
 - b. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 - c. Door: Flush panel with a core of non-combustible mineral-fiber insulation enclosed in sheet metal.
6. Primed and Factory Finish: Polyester powder coat; primed for field painting.
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - c. Latch/Lock: Tamperproof tool-operated cam latch.
 - d. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.
 - e. Gasketing: Extruded neoprene, around perimeter of door panel.
 - f. Color to match adjacent wall or ceiling color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aluminum-framed storefront systems.
 - 2. Aluminum-framed entrance door systems.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, 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 type of 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.
 - 4. Include point-to-point wiring diagrams showing the following:
 - a. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- C. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

- A. Test and Evaluation Reports:
 - 1. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by qualified testing agency or manufacturer and witnessed by a qualified testing agency.
- B. Quality-Control Program: Developed specifically for Project, including fabrication and installation, in accordance with recommendations in ASTM C1401. Include periodic quality-control reports.
- C. Qualification Statements:
 - 1. For Installer and field testing agency.
- D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For aluminum-framed storefronts.

1.6 QUALITY ASSURANCE

- A. Qualifications:

1. Installers: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
2. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to Owner and Architect.

- B. 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.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

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: 10 years from date of Substantial Completion.

- B. Special Finish Warranty, Factory-Applied Finishes: 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 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing venting windows and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. 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, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Dimensional tolerances of building frame and other adjacent construction.
 3. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Deflection exceeding specified limits.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Glass breakage.
 - e. Noise or vibration created by wind and thermal and structural movements.
 - f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Failure of operating units.
- B. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of 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.
 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.
- D. Structural: Test in accordance with ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and 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.
- E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft..
- F. Water Penetration under Dynamic Pressure: Test in accordance with 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 12 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.
- G. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
- H. Noise Reduction: Test in accordance with ASTM E90, with ratings determined by ASTM E1332, as follows.
1. Outdoor-Indoor Transmission Class: Minimum 34.
- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Interior Ambient-Air Temperature: 75 deg F.

2.3 STOREFRONT SYSTEMS

- A. Products: Subject to compliance with requirements, provide one of the following:
1. EFCO Corporation; System 403T Wall (exterior), System 402 (interior).
 2. Kawneer North America, an Arconic company; TriFab VG 451T (exterior), TriFab VG 451 (interior).
 3. Oldcastle Building Envelope (OBE); CRH Americas; Series 3000 Thermal (exterior), FG-3000 (interior).
 4. Tubelite Inc.; Series T14000 (exterior), Series 4500 (interior).
 5. YKK AP America Inc; System YES 45 TU (exterior), System YES 45 FI (interior).
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Interior Framing Construction: Nonthermal.
 2. Exterior Framing Construction: Thermally Broken.
 3. Glazing System: Retained mechanically with gaskets on four sides.
 4. Glazing Plane: Center.
 5. Finish: High-performance organic finish.
 6. Fabrication Method: Field-fabricated stick system.
 7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 8. Steel Reinforcement: As required by manufacturer.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS

- A. Products: Subject to compliance with requirements, provide one of the following:

1. EFCO Corporation; ThermaStile Thermal Entrances; stiles and rails modified to dimensions indicated.
 2. Kawneer North America, an Arconic company; Insulpour Thermal Entrances; stiles and rails modified to dimensions indicated.
 3. Oldcastle BuildingEnvelope (OBE); CRH Americas; AD-375 Thermal Entrance; stiles and rails modified to dimensions indicated.
 4. Tubelite Inc.; Thermal-Block Entrance System Doors - Thermally-Broken; stiles and rails modified to dimensions indicated.
 5. YKK AP America Inc; Megatherm Entrances; stiles and rails modified to dimensions indicated.
- B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
1. Door Construction: 2-inch overall thickness, with minimum 0.188-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.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 2. Door Design: As indicated.
 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
 4. Finish: Match adjacent storefront framing finish.

2.5 ENTRANCE DOOR HARDWARE

- A. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.
1. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 2. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
- B. Weather Stripping: Manufacturer's standard replaceable components.
1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.6 GLAZING

- A. Glazing: Comply with Section 08 80 00 "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: Comply with Section 08 80 00 "Glazing."
- D. Weatherseal Sealants: ASTM C920 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 B209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- C. Structural Profiles: ASTM B308/B308M.
- D. Steel Reinforcement:
 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- E. Steel Reinforcement 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 in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with 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, 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 A123/A123M or ASTM A153/A153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Strap Anchor: Aluminum extrusion with thermal separation designed to engage frame and tie assembly to supporting construction as represented on Drawings; delegated design.
- E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.
- F. Rigid PVC filler.

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. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 4. Physical and thermal isolation of glazing from framing members.
 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

- 6. 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. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.
- 2.10 ALUMINUM FINISHES
- A. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. 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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Install joint filler behind sealant as recommended by sealant manufacturer.
- I. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 08 80 00 "Glazing."

3.4 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

- A. Install entrance 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 in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.5 ERECTION TOLERANCES

- A. 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 08 41 13

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SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SECTION SUMMARY

A. Section Includes:

1. Door hardware and related accessories.
2. Security system hardware items and coordination.

B. Related Requirements:

1. Division 8 Section "Hollow Metal Doors and Frames".
2. Division 8 Section "Flush Wood Doors".
3. Division 8 Section "Integrated Metal Door Opening Assemblies".
4. Division 8 Section "Coiling Counter Doors."
5. Division 8 Section "Overhead Coiling Doors."
6. Division 8 Section "Overhead Coiling Grilles."
7. Division 8 Section "Aluminum-Framed Entrances and Storefronts."
8. Division 8 Section "Glazed Aluminum Curtain Walls".
9. Division 26 Sections for electrical connections including conduit and wiring for power, signal and control systems.
10. Division 28 for provisions for electronic security system and for connections to building fire alarm system.

1.2 REFERENCES

A. The publications listed below, including the amendments, addenda and designated changes, form a part of this specification to the extent referenced.

1. Federal Specifications (FS): FF-H-111C-74 Hardware, Builders Shelf and Miscellaneous.
2. National Fire Protection Association (NFPA):
 - a. Standard 70, National Electric Code.
 - b. Standard 80, Fire Doors and Windows.
 - c. Standard 101, Life Safety Code.
 - d. Standard 252, Standard Methods of Fire Tests of Door Assemblies.
3. American National Standards Institute (ANSI):
 - a. A156.6, Architectural Door Trim.
 - b. A156.18, Materials and Finishes.
4. International Code Council: International Building Code (IBC).
5. Americans with Disabilities Act (ADA): Standards for Accessible Design.
6. Door and Hardware Institute (DHI):
 - a. Abbreviations and Symbols.
 - b. Keying Systems and Terminology.
 - c. Recommended Locations for Builder's Hardware for Custom Steel Doors and Frames.
7. Underwriters Laboratories, Inc. (UL): UL-BMD, Building Materials Directory.

1.3 SUBMITTALS

- A. Qualification Data: Submit supplier and installer qualifications verifying years of experience and hardware manufacturers' certifications; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.
- B. Hardware Schedule: Submit a door hardware schedule in the manner and format prescribed and used herein, complying with the actual construction progress. Hardware schedules are intended

for coordination of the work. Review and acceptance by the Architect or Owner does not relieve the Contractor of his exclusive responsibility to fulfill the requirements as shown and specified.

1. Hardware Schedule Content: Based on hardware indicated, organize hardware schedule into Sets or sets showing complete designations of every item required for each door opening. Schedule shall be vertical layout similar to the format used herein. Lines shall be double spaced with pages numbered and dated.
 - a. For doors of different sizes or where hinges, locks or closers are different, a separate heading shall be used. No labeled openings shall be combined with non-labeled openings. Horizontal hardware schedules are not acceptable. Include the following:
 - 1) Number, location, hand, fire rating, size and material of each door opening (hands and swings to be determined in relation to key side of opening).
 - 2) Type, style, function, size, finish and quantity of each hardware item.
 - 3) Name and manufacturer of each item.
 - 4) Fastening requirements.
 - 5) Explanation of abbreviations used (use nomenclature consistent with DHI's "Abbreviations and Symbols" wherever possible).
 - 6) Special mounting locations and instructions.
 - b. Combined submittals are not acceptable. Do not combine hardware schedules with door and frame shop drawings.
 - c. Schedules not adhering to these parameters will not be reviewed.
 2. Hardware Schedule Index: Furnish an index cross referencing Contract Document door number and Hardware Set, and supplier's hardware set.
- C. Product Data:
1. Submit copies of manufacturers' specifications, maintenance and keying manuals, and installation instructions for each item of door hardware.
 2. Include photographs, catalog cuts, marked templates and other data as may be required to show compliance with these Specifications.
- D. Samples:
1. Submit full size hardware samples as requested by the Architect.
 2. Items shall remain on file in the Architect's office until all other similar items have been installed in the project. At that time, items on file will become Owner Maintenance Stock.
- E. Templates: Provide necessary templates and/or physical hardware to all trades or factories requiring them so they may cut, reinforce or otherwise prepare their material or product to receive the hardware item. If any manufacturer requires physical hardware, ship to them such hardware via prepaid freight in sufficient time to prevent any delay in the execution of their work.
- F. Keying Schedule: Detailed keying system schedule, indicating Owner's approved keying system, for Owner's review and approval. Include the following:
1. Schematic keying diagram
 2. Index identifying each key set to unique door designations.
 3. Bitting list.
- G. Wiring Diagrams: After Hardware Schedule has received Architect's approval; submit the following:
1. Diagrammatic details of electrified door hardware. Include fire alarm and/or access control system interface where applicable. Diagrams shall be complete by opening and shall indicate connections between all components affected. Manufacturers' standard line diagrams are not acceptable. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.

2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- H. Operations and Maintenance Data: Furnish two copies of the Operation and Maintenance manual. The manual shall consist of a hard cover and three-ring binder with the project name on the front. Include the following:
1. Maintenance instructions for each item of hardware supplied.
 2. Copy of the final Door Hardware Schedule.
 3. Catalog cuts for all items scheduled.
 4. Names and phone numbers of the factory representatives for each item supplied.
 5. Copy of the final Keying Schedule.
 6. Include any specialized tools needed to maintain the hardware.
- I. Warranty: Special warranties specified in this Section.
- 1.4 QUALITY ASSURANCE
- A. Contractor: Assign the installation of hardware to tradesmen experienced in the installation of commercial door hardware.
- B. Supplier Qualifications:
1. Supplier shall be a recognized architectural door hardware supplier, with warehousing facilities, who has been furnishing hardware in the Project's vicinity for a period of not less than two years.
 - a. Supplier's responsibilities include supplying and installing door hardware. Supplier must employ an Architectural Hardware Consultant who shall be available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware.
 - b. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 2. Hardware Installers shall be trained and certified by the Lock, Door Closer, and Exit Device Manufacturers
 3. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
1. Substitutions: Manufacturers and model numbers are listed to establish a standard of quality and design. Architect must approve all proposed product substitutions. Any request for substitution must be submitted ten days prior to Bid Date, to allow sufficient time for consideration and time for any addendum to be added to the Bid Documents. In accordance with Division 1 Section "Product Substitution Procedures", required data and physical samples must be furnished.
- D. Accessibility for Disabled Persons: Special hardware requirements for knurling, slow acting closers or other barrier free opening requirements shall be provided as indicated in the Door Hardware Sets and as required to comply with the U.S. Department of Justice's "ADA Standards for Accessible Design".
- E. Hardware for Fire Doors and Exit Doors: Hardware for fire doors shall conform to NFPA 80; hardware for exit doors shall conform to NFPA 101. Other requirements specified shall also apply. Such hardware shall comply with the applicable UL standards for the intended use specified and be listed in UL BMD, or be labeled and listed by another testing laboratory deemed acceptable by the Owner and Architect.
1. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

- a. Test Pressure: After five minutes into the test, neutral pressure level in furnace shall be established at 40" or less above the sill.
- F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- G. Keying Conference: Conduct conference at Project site. In addition to Owner, Contractor, and Hardware Supplier's Architectural Hardware Consultant, conference participants shall also include Hardware Installer.
 - 1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
- H. Pre-Installation Conference: Conduct conference at Project site. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
 - 1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 - 2. Review sequence of operation for each type of electrified door hardware.
 - 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 required testing, inspecting, and certifying procedures.
- I. Reference Standards: Except as otherwise required by governing authorities or Contract Documents, comply with applicable provisions of Door and Hardware Institute.

1.5 PRODUCT DELIVERY

- A. Deliver door hardware to the Contractor. Direct factory shipments (drop shipments) to the job site are not acceptable.
 - 1. Deliver items of hardware at the proper times to the proper locations (shop or project site) in their original individual containers, complete with necessary appurtenances including screws, keys, manufacturers' printed instructions, and where necessary, installation templates for manufacturer's suggested installation. Mark each individual container with the manufacturer's name and catalog number as they appear in the hardware schedule.
- B. Representatives of the Contractor and the Hardware Supplier shall jointly inventory the door hardware. Replace items damaged in shipment promptly and with proper material without additional cost to the Contractor. Handle all hardware in a manner to eliminate marring, scratching or damage.
- C. Keys and Cores:
 - 1. Supply construction master keys and cores to Contractor when cylinders are delivered, for use during construction.
 - 2. Prior to the scheduled completion of the project, manufacturer shall ship all permanent keys and cores, including permanent control keys, directly to the Owner via Registered Mail, Return Receipt Requested or other pre-approved means. Under no circumstance shall any permanent keys or cores be furnished direct to the Contractor.
- D. Key Cabinet: Deliver key cabinet to the Owner prior to building occupancy.

1.6 WARRANTIES

- A. Warranties shall be furnished in accordance with Division 1. Materials furnished under this Section shall be warranted to be free from defects in material and workmanship for a period of one year from substantial completion of the Project.
 - 1. Exceptions:

- a. Locksets and exit devices shall be warranted for a minimum of five years from date of manufacture.
 - b. Surface closers and continuous hinges shall be warranted for a minimum of ten years from date of manufacture.
2. Installation workmanship shall be warranted for a period of one year after Final Acceptance.

1.7 EXTRA MATERIALS

- A. Furnish three dozen extra screws and other fasteners of each size, type and finish used. Deliver extra screws and fasteners to the Hardware Installer for use during installation. All unused screws and fasteners, and all special installation tools furnished with the hardware, shall be turned over to the Owner at the completion of the job.
 1. Include 50 blank keys for each cylinder manufacturer furnished.
 2. Furnish one complete Cylinder Bitting Kit for each key system provided.

PART 2 - PRODUCTS

2.1 TEMPLATE HARDWARE

- A. Hardware to be applied to metal or pre-finished doors and frames shall be made to template. Coordinate hardware locations to prevent interference with other hardware items.

2.2 HARDWARE ITEMS

- A. All hardware shall be clearly and permanently marked by the manufacturer where it will be visible after installation.
- B. Continuous Hinges: Hager Companies, Pemko or Stanley.
 1. Geared extruded aluminum leafs with interlocking cover and nylon bearings, full door height.
- C. Cylinders and Keying:
 1. Provide cylinders for locksets, deadlocks, exit devices, and all other locking devices indicated in Hardware Sets.
 2. Description:
 - a. Cylinders shall be interchangeable core type with cores removable by special control key.
 - b. Cylinder parts manufactured from brass, bronze, stainless steel, or nickel silver.
 - c. Equip all cylinders with keyed-alike, brass, color-coded, temporary cores for use during construction and for testing the hardware; plastic cores are prohibited.
 - d. Include all necessary extensions, cams, tail pieces and hardened collars required for a complete installation.
 3. Manufacturers:
 - a. Mechanical, Electrical and Machine Rooms – Corbin Russwin utilizing the “D2” keyway; keyed to the existing master key system.
 - b. All other doors: Best Access System’s “PEAKS” System or Sargent “Signature” System; both systems keyed to the existing master key system.
 4. Key System: Provide the types of systems required (e.g. master, grand master, great grand master, etc.); nomenclature and layout to be consistent with DHI "Keying Systems and Terminology".
 - a. Keying is the responsibility of the Contractor; and shall be performed by the cylinder supplier.
 - b. Key System Summary, Cover Sheet, and Letter of Authorization shall accompany Keying Schedule and Purchase Order sent to Factory.
 - c. Keys: Provide keys of nickel silver only in the following quantities (per system):

- 1) Grand Master Keys: Five.
 - 2) Master Keys: Six per set.
 - 3) Change Keys: Three per lock.
 - 4) Interchangeable Core Construction Keys: Twelve.
 - 5) Interchangeable Core Control Keys: Five permanent and three temporary.
- d. Identification: Stamp permanent keys and cores with the applicable key mark for identification. These visual key control marks or codes shall not include the actual key cuts. Stamp change keys with the key change number; stamp all master keys and grand master keys "DO NOT DUPLICATE".
- D. Locks and Latches: Best Access Systems, Corbin Russwin or Sargent.
1. Locks and latches shall be equal to Corbin Russwin ML2000 Series with NSM trim.
 2. All internal working parts shall be brass, bronze, steel or stainless steel. For each lock and latchset, provide strike box and square corner ASA strike with curved lips of sufficient length to protect frames.
 - a. Furnish knurling to lever on corridor side of door to all doors leading to hazardous areas (e.g. Mechanical Rooms, Electrical Rooms, Elevator Machine Rooms, etc.).
 3. Furnish keyed devices with cylinders keyed to building system.
- E. Exit Devices Accessories: Dorma Door Controls, Sargent or Von Duprin.
1. Refer to the Hardware Set Schedule for grade and function.
 2. Where lever handle functions are required on exit devices, they shall match the design and construction of lever handles specified for mortise locks.
 - a. At mortise exit devices, provide strike box and square corner, stainless steel ASA strike with curved lips of sufficient length to protect frames.
 3. Furnish keyed devices with cylinders keyed to building system.
- F. Automatic Flush Bolts and Coordinators: Hager Companies, Ives or Rockwood.
1. Coordinators shall be continuous across door header, complete with filler plates and closer brackets as required. Furnish coordinators primed for field painting.
 2. Provide standard strikes with wrought boxes for top bolts.
- G. Door Closers: Corbin Russwin, Dorma Door Controls or LCN Closers.
1. Door closers shall be Corbin Russwin DC8000 Series, Dorma 8900 Series or LCN 4040XP Series. Closer arms shall be forged and fluid shall accommodate all applicable weather conditions.
 - a. At parallel arm installations, provide manufacturer's heaviest-duty arm assembly.
 2. Where factory sized closers are specified, sizes are to be determined by manufacturer's recommendations for door size, location and applicable handicap requirements.
 3. Locate closers on the least conspicuous side of the door (side opposite public view).
- H. Low Energy Operators: LCN Closers, Nabco Entrances (Gyro-Tech), Inc. or Stanley Access Technologies.
1. Operators shall be of heavy-duty construction. Sizes are to be determined by manufacturer's recommendations for door size and location.
 2. Operation:
 - a. Pressing actuator switch automatically opens door leaf to 90-degrees, operator then manually closes door after variable time delay expires.
 - b. Provide wall- and jamb-mounted stainless steel actuator plates as indicated. Hard-wired actuators shall operate on voltage provided by operator.
 - 1) Engrave Universal Accessibility Symbol on plate; fill with blue enamel paint.
 3. Control Unit:

- a. Micro-processor controlled.
 - b. Provide adjustable opening speed, adjustable backcheck speed, adjustable closing speed, and adjustable hold-open period.
 - c. Include built-in 3-position switch for "OFF", "ON" and "HOLD-OPEN" operation and to deactivate actuator switches.
 - d. Provide safety-stop feature: If object or obstruction is encountered during opening and/or closing cycles, door operator stops and slowly returns to closed or open position respectively.
 - e. Provide with safety circuit so that if actuator switch is activated when door is latched or locked, power operator resets without operator and/or door damage.
4. Accessories: Furnish complete with fastenings, fittings, and other accessories as required for a complete installation.
 5. Manufacturer shall provide detailed wiring diagrams showing point-to-point hook-up of all components affected (e.g. operators, actuators, power, etc.).
 6. Coordinate electrical connection and installation with Division 26.
- I. Architectural Door Trim: Hager Companies, Ives or Rockwood.
1. Protection Plates: Beveled on all sides, equal to Hager #194S Series.
 - a. Unless otherwise indicated in the Hardware Set Schedule, or where narrow bottom rails dictate a smaller size, armor plates shall be 34" high, kick plates shall be 8" high and mop plates shall be 6" high.
 - b. Armor plates and kick plates shall be 2" less than the door width on single doors and 1-1/2" less than the door width on double doors, mop plates shall be 1/2" less than the door width on all doors.
 - c. Armor plates on labeled doors shall comply with the requirements of NFPA 80.
 - d. Where required, factory-prepare flat goods for cylinders and turn pieces.
 2. Push/Pull Plates: Beveled on all sides, fabricated from 1/8" thick stainless steel
 - a. Except where narrow door stiles dictate a smaller size, push plates shall be 8" wide by 16" high.
 - b. Pull plates shall be 4" wide by 16" high.
 3. Door Pulls: Fabricate pull bars from solid stainless steel bar stock. Provide a minimum 2-1/4" clearance; 10" center-to-center.
 4. Push and Pull Bars:
 - a. Fabricate push and pull bars from solid stainless steel bar stock. Provide units complete with spacers threaded to accept concealed through bolt attachment including provision for spanner tightening of bolts and assembly. Do not furnish grommets at stile/pull interface.
 - b. Refer to the Hardware Set Schedule for style and design.
 5. Fasteners: All flat goods shall be furnished with Phillips undercut, countersunk screws per ANSI A156.6. Trusshead screws are not acceptable.
- J. Auxiliary Hardware: Hager Companies, Ives or Rockwood.
1. Stops: Furnish wall stops equal to Rockwood #400 wherever door strikes wall. Where wall stops are not suitable, furnish floor stops equal to Rockwood #441CU (with removable riser).
 2. Manual Flush Bolts: Top manual flush bolts shall not exceed 74" from floor to centerline.
 3. Silencers: Provide rubber silencers equal to Rockwood #608. Furnish three per single door and four per pair. Silencers are not required at aluminum frames or at doors specified to receive continuous seals or weather-stripping.
- K. Overhead Holders and Stops: Glynn-Johnson or Rixson.
1. Where wall or floor stops will not work, furnish surface-mounted overhead stops equal to Glynn-Johnson #90S.
- L. Thresholds, Weather-stripping and Seals: National Guard Products, Pemko or Zero International.

1. Refer to the Hardware Set Schedule for grade and style.
 2. Smoke Seals: At all fire-rated wood doors, all 20-minute rated doors, and any other doors required to be 'smoke resistant', provide the following:
 - a. Head and Jambs: Smoke seals equal to Pemko #S88BL.
 - b. Meeting Stile at Pairs: Astragal seals equal to one Pemko #375CR or two Pemko #316AS as appropriate for intended hardware operation.
 - c. Refer to the Drawings for required locations.
 3. Where required, field-modify thresholds to receive strikes for exit devices and flush bolts.
- M. Key Control System: Lund Equipment, MMF Key Control Products or Telkee.
1. Wall-mounted metal cabinet with baked-enamel finish; containing key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150% of the number of cylinders required herein.
 - a. Equip cabinet with hinged-panel door, key-holding panels, and pin-tumbler cylinder door lock.
 - b. Cross-Index System: Multiple-index system for recording key information. Include three receipt forms for each key-holding hook.
- N. Fire Department Access Vault: Knox Company.
1. Basis of Design: Recessed-type, Series 3200 "Knox Box".
 2. Size: 5" wide by 4" high by 3" deep; 7" by 7" outside dimension of recessed mounting flanges.
 3. Finish: Weather-resistant TGIC polyester powder coat; color as selected by Architect.
 4. Include mounting kit for recessed installation in masonry construction.
- O. Electromagnetic Door Holders: Bosch Security Systems.
1. See details for size and shim requirements.
 2. Coordinate electrical connection and installation with Divisions 26 and 28.
- P. Magnetic Locks and Accessories: Schlage Electronics, Securitron or Security Door Controls.
1. Units shall operate at 24V current with a minimum holding force of 1200-pounds and built-in electronics to eliminate residual magnetism and provide transient suppression.
 2. Coordinate electrical connection and installation with Division 28.
- Q. Magnetic Door Contacts: GE Security (Sentrol).
1. Magnetic door contacts shall be GES #1078W-N.
 2. Provide built-in, end of line resistors as required by the Electronic Security Control System.
 3. Coordinate electrical connection and installation with Division 28.
- R. Special Tools: Provide any necessary special tools (e.g. spanner and socket wrenches, dogging keys, etc.) required to service and adjust hardware items
- ### 2.3 HARDWARE FINISHES
- A. Base metals: Produce hardware units of basic metal and forming method indicated, using manufacturers standard metal alloy composition, temper and hardness, but in no case of lesser quality than specified or inferred by use of a particular manufacturer's number, style or grade or as established by appropriate referenced specification listed herein.
- B. Finishes: Finishes shall conform to the quality of finish including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than the standards established by ANSI/BHMA A156.18 or Federal Specifications FF-H-111C as applicable.
1. All exposed hardware except surface closers and butt hinges shall be satin stainless steel, ANSI/BHMA 630/US32D.
 - a. Factory-finish surface closers to match satin stainless steel.

- b. Butt hinges at exterior doors and doors in wet areas shall be satin stainless steel; butt hinges at all other doors shall be satin chrome plated, ANSI/BHMA 652/US26D.
 - c. Continuous geared hinges shall have a clear anodized finish.
 - d. Items of hardware not available in stainless steel shall be furnished with a stain chrome finish.
2. Where painting of primed surfaces is required, refer to Division 9 specifications.

2.4 FASTENERS

- A. Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping or sheet metal screws except as specifically indicated.
1. All hardware shall be installed using screws and attachments furnished with the hardware; no other screws or attachments and acceptable. Provide Phillips flat head or oval head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces of other work, to match the finish of such work as closely as possible, except as otherwise indicated.
 - a. Where wood screws are required they shall be full thread (to the head) type. Combination wood/machine screws, in lieu of wood screws, are not acceptable.
 2. 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.
 - a. Closers and exit devices installed on wood doors shall be furnished with thru-bolts and back-plates fabricated from stainless steel or aluminum, with a brushed or satin finish. Provide plates with beveled edges, of matching size to closers and devices.
 3. Furnish fasteners which are compatible with both the unit fastened and the substrate, and which will not cause corrosion or deterioration of hardware, base material reinforcement or fastener. Furnish wall stops with "Toggler" anchors and wood screws. Furnish thresholds and floor stops with lead anchors and 1/4-20 stainless steel machine screws.

PART 3 - EXECUTION

3.1 STORAGE AND HANDLING

- A. Representatives of the Contractor and the Hardware Supplier shall jointly inventory the door hardware. Replace items damaged in shipment promptly and with proper material without additional cost to the Contractor. Handle all hardware in a manner to eliminate marring, scratching or damage.
1. A dry, locked storage space complete with adequate shelving shall be set aside for the purpose of unpacking, sorting out, checking and storage. Control the handling and installation of hardware items, whether immediately replaceable or not, so completion of the work will not be delayed by losses before or after installation.
 2. Tag each item or package separately, with identification related to the final approved hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of thickness, profile, swing, security and similar requirements indicated as necessary for proper installation and function.

3.2 COORDINATION

- A. Coordinate Door Hardware Schedule submission and hardware ordering to insure delivery of all items as directed by the Contractor.
1. Prior to ordering any hardware, examine the shop drawings and details of doors and frames and other substrate suppliers to determine that the proper type and size pieces of hardware

are being furnished. No extra for material or labor will be allowed for any corrections that should have been eliminated by proper prior coordination.

- B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, and access control system.

3.3 INSTALLATION

- A. Install each hardware item in accordance with final approved Hardware Schedule and manufacturer's instructions.
 - 1. Set hardware level, plumb and true to line and location.
 - 2. Adjust and reinforce attachment substrate as required for proper installation and operation of hardware.
 - 3. Drill and countersink units which are not factory-prepared for anchorage fasteners; space fasteners and anchors uniformly, in accordance with industry standards.
- B. Hardware Mounting Heights:
 - 1. Provide heights as indicated on Drawings, except as otherwise required for compliance with governing regulations.
 - 2. Where heights are not indicated, comply with mounting requirements of DHI "Recommended Locations for Builder's Hardware" on custom steel doors and frames.
- C. Fire Doors and Exit Doors: Hardware for labeled fire doors shall be installed in accordance with the requirements of NFPA 80. Hardware for listed exit doors shall be installed in accordance with the requirements of NFPA 101.
- D. Hinges:
 - 1. Install steel doors and wood doors to comply with reference standards, as specified in door sections.
 - 2. Where shimming is required to comply with tolerances, provide metal shims only.
- E. Closers:
 - 1. Do not install parallel arm closers until after weather-stripping or seals have been installed on head frame (where weather-stripping or seals are scheduled).
 - 2. Do not cut weather-stripping or seals for attachment of closer brackets or shoes.
 - 3. Adjust closers to control door swing and to provide positive latching of doors.
 - a. Adjust closers not to exceed following manual opening forces:
 - 1) Exterior doors: As required to close and latch each leaf.
 - 2) Interior doors (non-fire-rated): Maximum 5-pound opening force.
 - 3) Fire-rated doors: As required to close and latch each leaf.
 - b. After air-handling system has been balanced, make final adjustment of all closers.
- F. Door Stops:
 - 1. Install stops for maximum degree of door opening swing allowed by conditions of installation.
 - 2. Locate floor stops so as not to create a tripping hazard.
 - 3. Locate wall stops centered on spindle of lever handles.
- G. Weather-stripping and Seals:
 - 1. Install continuous around door heads and jambs, and meeting stiles of pairs of doors.
 - 2. Install bottom weather-stripping and automatic door bottoms for full width of door.
 - 3. Do not cut weather-stripping or seals for attachment of closer brackets or shoes.

4. Align rain drips with the bottom edge of the door frame rabbet, set in a bed of sealant, and attach with stainless steel fasteners.
 5. Set all exterior thresholds in full bed of mastic sealant.
- H. Fire Department Access Vault: Install in accordance with manufacturer's instructions in location as directed.
- I. Cylinder Cores: When notified by the Owner, remove construction cores and install permanent cores in the presence of the Owner's designated representative. Upon removal of temporary cores, verify that all locking components (e.g. collars, tailpieces, etc.) are still intact.
1. It is the Contractor's responsibility to return the construction cores and keys to the manufacturer. Construction cores and keys remain the property of the Cylinder Manufacturer.
- J. Key Cabinet: Install in accordance with manufacturer's instructions in location as directed. Instruct the Owner in the use of the key control system.
- 3.4 ADJUST AND CLEAN
- A. General: To insure proper operation and function of every unit, adjust and check each operating item of hardware and each door. Lubricate moving parts with type lubrication recommended by the manufacturer (graphite-type if no other recommended). Replace unit that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Verify that the Owner has been supplied with manufacturers' installation and maintenance manuals, catalogs, and any special adjusting tools normally supplied by the manufacturer.
- B. Final Adjustment: Wherever hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and perform a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate as necessary to restore proper function and finish of hardware and doors.
1. Prior to acceptance of any electrical hardware system, an operational test shall be performed to determine if devices are functioning as intended by the specifications. Wiring shall be tested for correct voltage, current-carrying capacity, and proper grounding. Stray voltages in lock wiring shall be eliminated to prevent locking devices from releasing in critical situations.
- C. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
 2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.
- 3.5 HARDWARE SET SCHEDULE
- A. Refer to drawings.

END OF SECTION

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SECTION 08 80 00 GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds and accessories.

1.2 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C1036 - Standard Specification for Flat Glass.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
- I. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- J. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- M. GANA (GM) - GANA Glazing Manual.
- N. GANA (SM) - GANA Sealant Manual.
- O. GANA (LGRM) - Laminated Glazing Reference Manual.
- P. ICC (IBC) - International Building Code.
- Q. ITS (DIR) - Directory of Listed Products.
- R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- S. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.
- T. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- U. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- V. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.
- W. UL (DIR) - Online Certifications Directory.
- X. UL 9 - Standard for Fire Tests of Window Assemblies.
- Y. UL 10B - Standard for Fire Tests of Door Assemblies.

- Z. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Certificate: Certify that products of this section meet or exceed specified requirements.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM) and GANA (LGRM) for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.5 MOCK-UPS

- A. Locate within framing set in masonry mockup.

1.6 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Glass Manufacturers:
 - 1. AGC Glass North America, Inc: www.agcglass.com.
 - 2. Cardinal Glass Industries: www.cardinalcorp.com.
 - 3. Guardian Glass, LLC: www.guardianglass.com.
 - 4. Pilkington North America Inc: www.pilkington.com/na.
 - 5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com.
- B. Fire-Protection-Rated Glass: Provide products as required to achieve indicated fire-rating period.
 - 1. Manufacturers:
 - a. SAFTIFIRST, a division of O'Keeffe's Inc: www.safti.com/#sle.
 - b. Technical Glass Products: www.fireglass.com/#sle.
 - c. Vetrotech North America: www.vetrotechusa.com/#sle.

2.2 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
5. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.3 GLAZING UNITS

A. Type G-1 - Monolithic Interior Vision Glazing:

1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Fully tempered safety glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

B. Type G-3 - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve fire-doors indicated fire-rating period as indicated on drawings.

1. Applications:
 - a. Glazing in fire-rated door assembly.
 - b. Glazing in fire-rated window assembly.
2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
3. Safety Glazing Certification: 16 CFR 1201 Category II.
4. Fire-Rating Period: As indicated on drawings.
5. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code and authorities having jurisdiction
 - a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - b. "OH" - meets fire window assembly criteria including hose stream test of NFPA 257, or UL 9 fire test standards.
 - c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
 - d. "XXX" - placeholder that represents fire-rating period, in minutes.
6. Manufacturers:
 - a. Technical Glass Products; Firelite Plus: www.fireglass.com.

2.4 GLAZING COMPOUNDS

- A. Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

2.5 ACCESSORIES

- A. Setting Blocks: Neoprene, with 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color. Complying with ASTM C 1281 and AAMA 800 for products as follows:
 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- D. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air barrier and vapor retarder seal. Complying with AAMA 800 for the following types:
 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; color black.
- F. Glazing Clips: Manufacturer's standard type.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.

3.2 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.4 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- F. Carefully trim protruding tape with knife.

3.6 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- E. Place glazing tape on free perimeter of glazing in same manner described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Carefully trim protruding tape with knife.

3.7 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.8 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non-permanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.9 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

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SECTION 08 83 00 - MIRRORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Glass mirrors.

1.2 REFERENCE STANDARDS

- A. ASTM C1036 - Standard Specification for Flat Glass 2016.
- B. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.
- C. GANA (GM) - GANA Glazing Manual 2008.
- D. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors) 2011.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. VOC Submittal: Provide product data for field-applied mastics indicating VOC content in g/L; comply with limits of Section 01 61 16.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with recommendations of GANA (TIPS) "Mirrors Handle with Extreme Care: Tips For the Professional on the Care and Handling of Mirrors."

1.5 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mirror Glass - General: Select materials and/or provide supports as required to limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

- B. Mirror Glass : ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select); silvering, protective coating and physical characteristics complying with ASTM C1503; 6 mm minimum thick.
 - 1. Sizes noted on Drawings.

2.2 GLAZING ACCESSORIES

- A. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- B. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.
 - 1. Product produced specifically for setting mirrors.
 - 2. Product certified by mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors are installed.
 - 3. Sealants applied within the building waterproofing envelope: Comply with low-emitting requirements specified in Section 01 61 16.
 - 4. Manufacturers:
 - a. Gunther Mirror Mastics.
 - b. Palmer Products Corporation.
 - c. Bohle.
- C. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
 - 1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.05 inch.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.062 inch.
 - 3. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bottom Trim:
 - 1) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Shallow Nose "J" Moulding Lower Bar.
 - 2) C.R. Laurence Co.
 - 3) Stylmark; J-Molding Lower Bar.
 - b. Top Trim:
 - 1) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Deep Nose "J" Moulding Lower Bar.
 - 2) C.R. Laurence Co.
 - 3) Stylmark; J-Molding Lower Bar.
- D. Fasteners: Fabricated of compatible metal to fastened metal.

2.3 FABRICATION

- A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.
- B. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Flat polished edge.
 - 1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.
- D. Film-Backed Safety Mirrors:

1. Apply film backing with pressure-sensitive adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections.
2. Use adhesives and film backing compatible with mirror backing paint as certified by mirror manufacturer.
3. Provide film backing on all glass mirrors.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.

3.2 INSTALLATION - GENERAL

- A. Install mirrors in accordance with GANA recommendations.
- B. Set mirrors plumb and level, free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Do not permit edges of mirrors to be exposed to standing water.
- E. Wall-Mounted Mirrors:
 1. Install mirrors with mastic and mirror channels.
 2. Install mirror hardware in the form of J-channels that are fabricated in single lengths to fit and cover top and bottom edges of mirrors.
 3. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

3.3 CLEANING

- A. Remove labels after work is complete.
- B. Clean mirrors and adjacent surfaces.

3.4 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

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SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.
 - 3. Grid suspension systems for gypsum board ceilings.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation Reports: For embossed, high-strength steel studs and tracks, firestop tracks, post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage qualified professional engineer as defined in Section 014000 "Quality Requirements" and as follows to design non-structural metal framing.
 - 1. Engineering Responsibility: Verification of contractor selections and shop drawings comply with referenced standards and criteria of the Drawings and specifications.
 - 2. Professional Engineer Qualifications: Professional engineer legally qualified to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated and defined as those performed for installations of non-structural metal framing that are similar to those indicated for this Project in material, design, and extent.
- B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- D. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft..

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Design Values:

- a. Deflection Limit: Design framing systems to withstand design loads without deflections greater than the following:
 - 1) L/240 unless otherwise noted.
 - 2) L/360 where Level 5 gypsum board finish is indicated, at tile backing panels, where plaster veneer is indicated, and elsewhere as indicated.
- b. Lateral Pressure:
 - 1) 5.0 psf unless otherwise noted.
 - 2) 7.5 psf at all pressurized plenums, entrance lobbies and vestibules with automatic entrances, and elsewhere as noted.
2. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
3. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653/A653M, G40.
 - a. EQ Coatings: Where an EQ coating is proposed in lieu of specified galvanized coating, submit written documentation from authorities having jurisdiction indicating proposed EQ coating is recognized by the authorities having jurisdiction as providing corrosion resistance equivalent to specified galvanizing.
- B. Studs and Tracks: ASTM C645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.
 1. Steel Studs and Tracks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) ClarkDietrich.
 - 3) Craco Manufacturing, Inc.
 - 4) Custom Stud.
 - 5) MarinoWARE.
 - 6) SCAFCO Steel Stud Company.
 - 7) Steel Construction Systems.
 - 8) Telling Industries.
 - 9) The Steel Network, Inc.
 - b. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection, unless indicated otherwise elsewhere.
 - c. Depth: As indicated on Drawings.
 2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C645 steel studs and tracks.
 - a. Manufacturer Certification: If embossed steel studs and runners are used, submit written certification from stud and runner manufacturer stating that the proposed stud meets or exceeds the span limitations indicated in ASTM C 754 with signature and seal of a structural engineer licensed in the state where the project is located.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 3-inch minimum vertical movement.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.; Deflex Clips.
 - 2) ClarkDietrich; Fast Top Clip.
 - 3) Fire Trak Corp; PosiKlip or RediKlip.
 - 4) MarinoWARE.
 - 5) SCAFCO Steel Stud Company; Deflection Clip Series.

- 6) Steel Construction Systems; Deflection Clip Series.
 - 7) Super Stud Building Products Inc.; Deflection Clips.
 2. Single Long-Leg Track System: ASTM C645 top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 3. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.; CST Slotted Deflection Track or SLP-TRK Slotted Deflection Track.
 - 2) ClarkDietrich; MaxTrak Slotted Deflection Track.
 - 3) MarinoWARE.
 - 4) Metal-Lite.
 - 5) Perfect Wall, Inc.; The System Slotted Deflection Track.
 - 6) SCAFCO Steel Stud Company; SCAFCO Slotted Leg Track System.
 - 7) Steel Construction Systems; Steel-Con Slotted Leg Track System.
- D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CEMCO; California Expanded Metal Products Co.; FAS Track.
 - b. ClarkDietrich; BlazeFrame, BlazeFrame RipTRAK or MaxTrak.
 - c. Fire Trak Corp; Fire Trak System attached to studs with Fire Trak Posi Klip.
 - d. MarinoWARE.
 - e. Metal-Lite.
 - f. Perfect Wall, Inc.; The System Slotted Deflection Track.
 - g. SCAFCO Steel Stud Company; SCAFCO Slotted Leg Track System.
 - h. Steel Construction Systems; Steel-Con Slotted Leg Track System.
- E. Metal Mounting Plates: Minimum thickness of 0.0538 inch galvanized steel plates of sizes and configurations detailed, or if not detailed, as required to accommodate the wall hung casework, millwork, railings or other items mounted to metal stud and wallboard walls and partitions.
 1. Provide plates designed, and certified, to support an imposed load of 250 lbs. per linear foot for handrails, grab bars and other ADA-compliant items. Provide plates designed, and certified, to support an imposed load of 144 lbs. per linear foot for all other items. All loads required above are in addition to the weight of the item supported by the back-up plate.
 2. Provide plates designed for screw-attachment to steel studs with back-up plate faces flush with face of studs or overlapping face of studs with pre-cut notches matching stud spacing.
 3. Products: Subject to compliance with requirements, provide one of the following products or an acceptable equivalent product:
 - a. ClarkDietrich; Backer Bar.
 - b. Metal-Lite. Inc.; Flush Mount or Notch-Tite.
 - c. Bailey Metal Products Limited; Baily Backer Bar.
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: 1-1/2 inches; unless otherwise indicated.

2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C645.
 1. Minimum Base-Steel Thickness: 0.0296 inch.
 2. Depth: As indicated on Drawings.
- H. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 1. Configuration: Hat shaped.
- I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
 1. Depth: As indicated on Drawings.
 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
 3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Hanger Attachments to Concrete:
 1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 or AC308 as appropriate for the substrate.
 - a. Uses: Securing hangers to structure.
 - b. Type: Torque-controlled, adhesive anchor or adhesive anchor.
 - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
 2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
- F. Furring Channels (Furring Members):
 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 2. Steel Studs and Tracks: ASTM C645.
 - a. Minimum Base-Steel Thickness: 0.0269 inch.
 - b. Depth: As indicated on Drawings.
 3. Embossed, High-Strength Steel Studs and Tracks: ASTM C645.
 - a. Minimum Base-Steel Thickness: 0.0190 inch.
 - b. Depth: As indicated on Drawings.
 4. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

- a. Minimum Base-Steel Thickness: 0.0329 inch.
5. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Hat shaped.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong Ceiling & Wall Solutions; Drywall Grid Systems.
 - b. Rockfon (Rockwool International); 640/660 Drywall Ceiling Suspension or SpanFast Drywall Ceiling Suspension for Corridors.
 - c. USG Corporation; Drywall Suspension System or Wall-to-Wall Drywall Suspension System.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
 1. Install metal back-up plates in accordance with plate manufacturer's written instructions using self-tapping pan-head screws of type and in quantity required by manufacturer to achieve full load capacity.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types and other assembly components indicated.
 1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
 2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.

- b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Shaped Furring Members:
1. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 2. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- 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.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Interior gypsum board.
 2. Exterior gypsum board for ceilings and soffits.
 3. Tile backing panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each specified product.
- B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.
- 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.

1.3 MOCKUPS

- A. Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 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. When the construction schedule proposed by the Contractor requires materials to be installed prior to reaching and maintaining manufacturer's required environmental conditions. provide the following:

1. A letter from the material manufacturer acknowledging the deviation from manufacturer's requirements and the manufacturer's acknowledgement of one of the following:
 - a. Agreement with conditions present for installation of materials, including a letter from the manufacturer stating that applicable warranties will not be compromised by these conditions.
 - b. Provide alternative materials and installation procedures accompanied by material samples, written detailed procedures for any materials deviating from contract requirements, and a letter from the material manufacturer acknowledging the changed conditions and confirming all material warranties will remain intact.
 - 1) Any additional cost of alternative solutions, for the benefit of scheduling, is at the Contractor's expense.
 - 2) Use of glass-mat-faced panel products is one possible solution, including the proper joint treatment and finishing.
 2. If an alternate approach is reviewed and preliminarily accepted by the Architect, present the approach to the Owner during a regular project meeting with trade contractor and manufacturer's technical representative present. If the Owner agrees to the change, make formal submittals in accordance with requirements specified in the Project Manual and obtain Architect's review of submittals prior to proceeding installation.
 3. All other provisions of the Contract Documents must be met.
- D. Do not install panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 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 E119 by an independent testing agency.
 1. Marking Fire-Resistance-Rated Assemblies: Apply hourly rating text in 4-inch high red numbers and black Arial font letters at maximum 10 feet between rating text applications as measured from beginning of one text application to end of next text application extending from one end of fire-resistance-rated wall to opposite end of fire-resistance-rated wall, located 6 inches above finished ceiling to bottom of text. Provide following hourly rating text as applicable to wall:
 - a. 1 HR
 - b. 2 HR
 - c. 3 HR
 - d. 4 HR
 - e. 1 HR Fire/Smoke
 - f. 2 HR Fire/Smoke
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.3 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.

2.4 INTERIOR GYPSUM BOARD

- A. Flexible Gypsum Board: ASTM C1396/C1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Gypsum; CertainTeed Flex Gypsum Board.
 - b. Continental Building Products, LLC.
 - c. National Gypsum Company; Gold Bond® High Flex® Gypsum Board.
 - d. USG Corporation; USG Sheetrock® Brand Flexible Gypsum Panels.
 2. Thickness: 1/4 inch.
 3. Long Edges: Tapered.
- B. Gypsum Ceiling Board: ASTM C1396/C1396M.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Gypsum; 1/2" Interior Ceiling Board.
 - b. CertainTeed Gypsum; CertainTeed Interior Ceiling Gypsum Board.
 - c. Continental Building Products, LLC; Sagcheck.
 - d. National Gypsum Company; Gold Bond® Ceiling Board.
 - e. USG Corporation; USG Imperial® Sag-Resistant Interior Ceiling Gypsum Base.
 2. Thickness: 1/2 inch.
 3. Long Edges: Tapered.
- C. Impact-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Gypsum; 5/8" M-Bloc® IR Type X with Mold & Moisture Resistance.
 - b. CertainTeed Gypsum; CertainTeed Extreme Impact Resistant Type X Gypsum Board with M2Tech Mold and Moisture Technology.
 - c. Continental Building Products, LLC; Protecta HIR 300 Type X with Mold Defense.
 - d. National Gypsum Company; Gold Bond® Hi-Impact® XP® Gypsum Board.
 - e. PABCO Gypsum; PABCO® Impact Resistant.
 - f. USG Corporation; USG Sheetrock® Brand Mold Tough® VHI (Very High Impact) Firecode® Core.
 2. Core: 5/8 inch, Type X.
 3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
 4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
 5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
 6. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements according to test in Annex A1.
 7. Long Edges: Tapered.
 8. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- D. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Gypsum; 5/8" M-Bloc® Type X with Mold & Moisture Resistance.
 - b. CertainTeed Gypsum; CertainTeed M2Tech Mold and Moisture Resistant Type X Gypsum Board.
 - c. Continental Building Products, LLC.
 - d. National Gypsum Company; Gold Bond® XP® Fire-Shield® Gypsum Board.

- e. USG Corporation; USG Sheetrock® Brand Mold Tough® Gypsum Panels.
2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.5 TILE BACKING PANELS

- A. Locations: Allowable only within spaces without plumbing or high-humidity conditions.
- B. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
 - c. National Gypsum Company; <Insert product designation>.
 - d. USG Corporation; USG Durock™ Glass-Mat Tile Backerboard.
 2. Core: 5/8 inch, Type X.
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Exterior Trim: ASTM C1047.
 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.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fry Reglet Corporation.
 - b. Gordon, Inc..
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:

1. Interior Gypsum Board: Paper.
 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 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, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.8 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

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 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Attach gypsum panels to framing provided at openings and cutouts.
- J. 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 C919 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.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- L. Fire-Resistance-Rated Assemblies: Provide marking of fire-resistance-rated assemblies as specified in Performance Requirements article in Part 2 of this Section.
- M. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c., unless otherwise recommended by manufacturer or referenced standards.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Flexible Type: Apply in double layer at curved assemblies.
 - 2. Ceiling Type: Ceiling surfaces.
 - 3. Impact-Resistant Type: As indicated on Drawings.
 - 4. Mold-Resistant Type: Vertical surfaces not indicated as other types.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLATION OF TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile outside of areas or walls with plumbing. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
 1. Install where a partition, wall, or ceiling traverses a construction joint (expansion, seismic or building control element) in the base building structure.
 2. Install where movement may occur at joints in a wall or partition supported by building systems that move differentially.
 3. Install where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear ft .
 4. Install in interior ceilings with perimeter relief so that linear dimensions between control joints do not exceed 50 ft and total area between control joints does not exceed 2500 sq ft .
 5. Install in interior ceilings without perimeter relief so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft .
 6. Install in exterior ceilings and soffits so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft .
 7. Install where ceiling framing members change direction.

8. Install at one side of door frames. Full height door frames shall be considered equivalent to a control joint.
9. Install all control joints at specific locations approved by the 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.
5. U-Bead: Use at exposed panel edges.
6. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
 4. Level 5: Public gathering spaces with wall lengths greater than 25 feet (including but not limited to corridors and lobbies), surface to receive wall coverings or murals.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

3.7 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will 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. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.
 - g.

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 09 29 00

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SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Porcelain tile.
 - 2. Glazed wall tile.
 - 3. Thresholds.
 - 4. Tile backing panels.
 - 5. Crack isolation membranes.
 - 6. Metal edge strips.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site].
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

1.5 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 and certified porcelain tile.

1.6 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.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.

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 waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Stone thresholds.
 - 2. Crack isolation membrane.
 - 3. Cementitious backer units.
 - 4. 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. Porcelain Tile Type PT-1 and PT-2: Glazed.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis-of-Design: Daltile.
 - b. American Marazzi Tile, Inc.
 - c. American Olean; a division of Dal-Tile Corporation.
 - d. Crossville, Inc.
 - e. Florida Tile, Inc.
 - f. Florim USA.
 - g. Grupo Porcelanite.
 - h. Interceramic.
 - i. Iris US.
 - j. Seneca Tiles, Inc.
- 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
- 3. Face Size: 12 by 24 inches.
- 4. Thickness: 5/16 inch.
- 5. Dynamic Coefficient of Friction: Not less than 0.42.
- 6. Tile Color, Glaze, and Pattern: Basis-of-Design – Daltile, Volume 1.0, color as selected by Architect from manufacturers full range.
- 7. Grout Color: As selected by Architect from manufacturer's full range.

B. Glazed Wall Tile Type CT-1 :

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Basis-of-Design: Daltile.
 - b. American Marazzi Tile, Inc.
 - c. American Olean; a division of Dal-Tile Corporation.
 - d. Daltile.
 - e. Grupo Porcelanite.
 - f. Jeffrey Court Inc..
 - g. Seneca Tiles, Inc.
- 2. Module Size: 6 by 6 inches.
- 3. Thickness: 5/16 inch.
- 4. Tile Color and Pattern: Basis-of-Design – Daltile Color Wheel Collection-Linear, color as selected by Architect from manufacturer's full range.
- 5. Grout Color: As selected by Architect from manufacturer's full range.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

- 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 10 according to ASTM C1353 or ASTM C241/C241M and with honed finish.

- 1. Description:
 - a. Uniform, fine- to medium-grained white stone with gray veining.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. C-Cure; C-Cure Board 990.
 - b. Custom Building Products; WonderBoard® Lite Backerboard.
 - c. FinPan, Inc; ProTEC Concrete Backer Board.
 - d. USG Corporation; DUROCK Cement Board.
 - 2. Thickness: 1/2 inch.

2.6 CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Crack Isolation Membrane, Fabric-Reinforced, Fluid-Applied: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Boiardi Products Corporation; a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.
 - b. Bonsal American, an Oldcastle company; B 6000 Waterproof- Crack Isolation Membrane with B 6000 Mesh.
 - c. Bostik, Inc; Hydroment Blacktop 90210.
 - d. Custom Building Products; Custom® 9240 Waterproofing and Anti-Fracture Membrane.
 - e. LATICRETE SUPERCAP, LLC; Laticrete Blue 92 Anti-Fracture Membrane.
 - f. MAPEI Corporation;.
 - g. Merkrete; a Parex USA, Inc. brand; Hydro-Guard 2000.
 - h. Southern Grouts & Mortars, Inc; Southcrete 1100 Crack Suppression.
 - i. Summitville Tiles, Inc.; S-9000.

2.7 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. LATICRETE SUPERCAP, LLC.
 - e. 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. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 - 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Medium-Bed, Modified Dry-Set Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 5/8 inch.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ARDEX Americas;
 - b. Bostik, Inc;.
 - c. Custom Building Products;.

- d. LATICRETE SUPERCAP, LLC;
 - e. 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. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.

2.8 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. LATICRETE SUPERCAP, LLC.
 - e. MAPEI Corporation.
- B. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.
 - b. Custom Building Products.
 - c. LATICRETE SUPERCAP, LLC.
 - d. MAPEI Corporation.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; aluminum exposed-edge material.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Basis-of-Design at Open edges of wall tile: Schluter FINEC, Stainless Steel.
 - b. Blanke Corporation.
 - c. Ceramic Tool Company, Inc..
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

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 waterproof membrane 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.

3.3 INSTALLATION OF CERAMIC TILE

- 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.
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors consisting of tiles 8 by 8 inches or larger.
 - c. Tile floors consisting of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. 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 following joint widths:
 - 1. Glazed Wall Tile: 1/16 inch.
 - 2. Porcelain Tile: 1/4 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. Do not extend cleavage membrane or crack isolation membrane under thresholds set in improved modified dry-set mortar. Fill joints between such thresholds and adjoining tile set on with elastomeric sealant.
- K. Metal Edge Strips: Install at locations indicated.
- L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 INSTALLATION OF TILE BACKING PANELS

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 INSTALLATION OF CRACK ISOLATION MEMBRANES

- 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, Concrete Subfloor:
 - 1. TCNA F113: Thinset mortar.
 - a. Thinset Mortar: Modified dry-set mortar.
 - b. Grout: High-performance unsanded grout.
 - 2. TCNA F125-Full: Thinset mortar on crack isolation membrane.
 - a. Ceramic Tile Type:
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.
- B. Interior Wall Installations, Masonry or Concrete:
 - 1. TCNA W202: Thinset mortar.
 - a. Ceramic Tile Type:
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.
 - 2. TCNA W244C : Thinset mortar on cementitious backer units.
 - a. Ceramic Tile Type:
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.

END OF SECTION 09 30 13

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Initial Selection: For components with factory-applied finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Panels: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
 - 3. Clips: Full-size hold-down clips.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - 5. Size and location of initial access modules for acoustical panels.
 - 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
 - 7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
 - 8. Minimum Drawing Scale: 1/8 inch = 1 foot.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, 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. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
 - 4. Impact Clips: Equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.9 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E1264.
 - 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

- A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

2.4 METAL SUSPENSION SYSTEM

- A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
 - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C635/C635M.

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - 2. Stainless-Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
 - 3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
 - 4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch- diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- F. Hold-Down Clips: Manufacturer's standard hold-down.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
 - 1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - a. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 4. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
 - a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.
 - 5. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.6 ACOUSTICAL PANEL CEILING SCHEDULE

- A. Acoustical Panels (Type APC-1): Conforming to the following:
 - 1. Light Reflectance: 0.90 or better; ASTM E1477.
 - 2. NRC Range: 0.70 or better; ASTM C423.
 - 3. Edge: Beveled tegular.
 - 4. Surface Color: White.
 - 5. Surface Finish: Non-directional fine texture.
 - 6. Shall withstand combined effects of temperatures to 104 degrees F and relative humidity to 90 percent without visible sag.
 - 7. Ten-year warranty for sag resistance.
 - 8. Basis-of-Design Product: Armstrong World Industries, Inc., Ultima Beveled Tegular Item #1912.
 - a. Other Approved Products:
 - 1) CertainTeed Corporation, Symphony m.

- 2) USG Interiors, Inc., Mars.
 - 3) Rockfon, Alaska.
9. Size: 24 inches x 24 inches.
 10. Grid: Intermediate-duty 9/16-inch exposed face.
- B. Acoustical Panels (Type APC-2): Conforming to the following:
1. Light Reflectance: 0.90 or better; ASTM E1477.
 2. NRC Range: 0.70 or better; ASTM C423.
 3. Edge: Beveled tegular.
 4. Surface Color: White.
 5. Surface Finish: Non-directional fine texture.
 6. Shall withstand combined effects of temperatures to 104 degrees F and relative humidity to 90 percent without visible sag.
 7. Ten-year warranty for sag resistance.
 8. Basis-of-Design Product: Armstrong World Industries, Inc., Ultima Beveled Tegular Item #1982.
 - a. Other Approved Products:
 - 1) CertainTeed Corporation, Symphony m.
 - 2) USG Interiors, Inc., Mars.
 - 3) Rockfon, Alaska.
 9. Size: 24 inches x 72 inches.
 10. Grid: Intermediate-duty 9/16-inch exposed face.

END OF SECTION 09 51 13

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Thermoset-rubber base.
 - 2. Rubber molding accessories.

1.2 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. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.3 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.

2. Flexco.
 3. Johnsonite; a Tarkett company.
 4. Roppe Corporation, USA.
- B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
1. Style and Location:
 - a. Style B, Cove: Provide in areas with resilient floor coverings.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed; preformed at exposed ends.
- G. Inside Corners: Job formed.
- H. Colors: As selected by Architect from manufacturers full range.

2.2 RUBBER MOLDING ACCESSORY

- A. Profile and Dimensions: As indicated.
- B. Locations: Provide rubber molding accessories in areas indicated.
- C. Colors and Patterns: As selected by Architect from manufacturers full range.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Metal Edge Strips: Extruded aluminum with mill finish, nominal 2 inches wide, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

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 corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 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.

END OF SECTION 09 65 13

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SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl composition floor tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of floor tile indicated.
- C. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 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. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basis-of-Design: Azterra by Tarkett.
- B. Tile Standard: ASTM F1066, Class 2, through pattern.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As selected by Architect from manufacturers full range.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

4. Moisture Testing: Perform tests so that each test area does not exceed 1000 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 F1869. 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 F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles 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 floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.

- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coat(s).
- E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 66 23 RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Epoxy matrix terrazzo with ground and polished finish.
- B. Divider strips, including forming custom school medallion where indicated.
- C. Control strips.
- D. Crack isolation.
- E. Moisture vapor treatment.

1.2 REFERENCE STANDARDS

- A. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.
- C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.
- D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.
- E. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.
- F. NTMA (GRAD) - Aggregate Gradation Standards; Current Edition.
- G. NTMA (EPOXY) - Epoxy Terrazzo Specifications; Current Edition.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.
- C. Shop Drawings: Indicate divider strip and control and expansion joint layout, and details of adjacent components. For precast units, detail profile and anchorage requirements.
- D. Samples: Submit two samples, 6 inch by 6 inch in size illustrating color, chip size and variation, chip gradation, matrix color, and typical divider strip.
 - 1. Final color selection to be determined during sample review process.
 - 2. Provide for flooring and precast units.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.
 - 1. Provide instructions to maintain floors in compliance with minimum slip retardant requirements for accessible route.
- H. Test Reports: Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified coefficient of friction performance criteria.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.
- B. Source Limitations: Obtain each color, grade, type, and variety of granular materials from one source with resources to provide materials of consistent quality in appearance and physical properties.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
 - 1. Minimum five years of documented experience.
 - 2. Associate member firm of the National Terrazzo and Mosaic Association, Inc.
- D. Installer Qualifications: Company specializing in performing the type of work specified in this section.
 - 1. Minimum five years of documented experience.
 - 2. Approved by matrix manufacturer.
 - 3. Contractor member of the National Terrazzo and Mosaic Association, Inc.
- E. Walkway Auditor: Certified by NFSI to test polished floors for static coefficient of friction according to NFSI 101-A.
- F. Static Coefficient of Friction: Achieve not less than 0.5 for level floor surfaces as determined by quality control testing according to NFSI 101-A.

1.5 PREINSTALLATION MEETING

- A. Conduct meeting at project site; schedule within 21 days of installation.
- B. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review special terrazzo designs and patterns.

1.6 MOCK-UP

- A. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size mock-up to be not less than 100 square feet.
- B. Locate where directed.
- C. Mock-up may remain as part of the work.
- D. Accepted mock-up to be quality reference standard for balance of project.
- E. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store terrazzo materials in a dry, secure area.
- B. Maintain minimum temperature of 60 degrees F.
- C. Keep products away from fire or open flame.

1.8 FIELD CONDITIONS

- A. Concrete must be cured 28 days; curing agents are not permitted for use in areas to receive work of this section.
- B. Do not install terrazzo when temperature is below 60 degrees F or above 90 degrees F.

- C. Maintain temperature within specified range 72 hours before, during, and 72 hours after installation of flooring.
- D. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- E. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
 - 1. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- F. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
- G. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- H. Acceptable Substrate: Coordinate with concrete trades to ensure completion of substrates conforming to the following requirements:
 - 1. Level tolerance: Concrete sub-floor shall be level with a maximum variation from level of 1/4-inch in 10 feet. Any irregularity of the surface requiring patching and/or leveling shall be done using epoxy and sand fill as recommended by manufacturer.
 - 2. Concrete finishing to be steel troweled.
 - 3. Saw cutting of control joints must be performed 12 to 24 hours after placement of the structural concrete and at a frequency compatible with ACI recommendations.

1.9 WARRANTY

- A. Provide materials and labor to replace work defective per NTMA standards.
- B. Warranty Period: 2 years from substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design - Resinous Matrix Terrazzo Flooring: Terrazzo & Marble Supply Companies; Terroxy Resin Systems: www.tmsupply.com/#sle.
- B. Other Acceptable Manufacturers - Resinous Matrix Terrazzo Flooring:
 - 1. Crossfield Products Corp., Dex-O-Tex Division; Product Spectrum: www.dex-o-tex.com.
 - 2. Master Terrazzo Technologies, LLC; Product Morricite: www.masterterrazzo.com.
 - 3. Sherwin-Williams Company: General Polymers Brand; Thin-Set Terrazzo #1100 System: www.generalpolymers.com/#sle.
 - 4. Terrazzo & Marble Supply Companies; Terroxy Resin Systems: www.tmsupply.com/#sle.

2.2 EPOXY MATRIX TERRAZZO APPLICATIONS

- A. Floors:
 - 1. Thickness: 3/8 inch, nominal.
 - 2. Aggregate Type: Marble chips.
 - 3. Aggregate Size: As required by approved sample.

2.3 MATERIALS

- A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
- B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.
 - 1. Physical Properties without Aggregates:

- a. Hardness: 60 to 85 per ASTM D 2240, Shore D.
 - b. Minimum Tensile Strength: 3000 psi (20.7 MPa) per ASTM D 638 for a 2-inch (51-mm) specimen made using a "C" die per ASTM D 412.
 - c. Minimum Compressive Strength: 10,000 psi (6.9 MPa) per ASTM D 695, Specimen B cylinder.
 - d. Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.
 - 1) Distilled water.
 - 2) Mineral water.
 - 3) Isopropanol.
 - 4) Ethanol.
 - 5) 0.025 percent detergent solution.
 - 6) 1.0 percent soap solution.
 - 7) 10 percent sodium hydroxide.
 - 8) 10 percent hydrochloric acid.
 - 9) 30 percent sulfuric acid.
 - 10) 5 percent acetic acid.
2. Physical Properties with Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide"; comply with the following:
- a. Flammability: Self-extinguishing, maximum extent of burning 1/4 inch (6.35 mm) per ASTM D 635.
 - b. Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F (0.0025 mm/mm per 0.5556 deg C) for temperature range of minus 12 to plus 140 deg F (minus 24 to plus 60 deg C) per ASTM D 696.
- C. Aggregate: Type as indicated; sized in accordance with NTMA aggregate gradation standards; color(s) as indicated, uniform in color.
1. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
 2. 24-Hour Absorption Rate: Less than 0.75 percent.
 3. Dust Content: Less than 1.0 percent by weight.
- D. Finishing Grout: Epoxy, color to match terrazzo matrix.
- 2.4 MIXES
- A. Reference Sample: The Contractor is to match existing terrazzo colors including aggregates and resin, submit samples for selection by the Architect.
- 2.5 ACCESSORIES
- A. Flexible Reinforcing Membrane: Matrix manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction; fiberglass reinforcement scrim.
- B. Moisture Vapor Treatment System: Epoxy matrix manufacturer's water-based epoxy system compatible with crack isolation system and flooring materials.
1. Basis-of-Design: Terrazzo & Marble Supply Companies; Terroxy Moisture Vapor Treatment.
- C. Divider Strips: 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
1. Form custom school medallion as indicated on Drawings.
- D. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.
- E. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.

- F. Accessory Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.
- G. Anchors and Reinforcement for Precast Units: As recommended by manufacturer for type of installation.
- H. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.
 - 1. Compliant with slip retardant requirements for accessible routes.
- I. Subfloor Filler: Latex type.
- J. Primer: Manufacturer's recommended primer for substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive terrazzo.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for terrazzo installation by testing for moisture vapor emission, internal relative humidity, and alkalinity; obtain instructions if test results are not within the following limits:
 - 1. Moisture Vapor Emission: Not greater than 3 lb per 1000 sq ft per 24 hours, tested according to ASTM F1869.
 - 2. Internal Relative Humidity: Maximum of 75 percent, tested according to ASTM F2170.
 - 3. Alkalinity: pH range of 5 to 9, tested according to ASTM F710.
 - 4. Test each concrete floor substrate, regardless of age and grade level, for moisture.
 - 5. Conduct test around perimeter of area or room, at columns, and where moisture may be evident.
 - 6. Prepare diagram of area or room showing location and results of each test.
- E. Verify that required floor-mounted utilities are in correct location.
- F. Verify dew point is a least 5 degree F less than slab and air temperature, prior to each day of installation.

3.2 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Random Crack Detail: For cracks over 1/16-inch width before surface preparation. Fill saw cut with 100 percent solids epoxy, followed by application of crack membrane with fiberglass mesh reinforcement embedded into the membrane. Note: Movement from the substrate may reflect through the finished flooring.

3.3 PREPARATION

- A. Clean substrate of foreign matter.
- B. Prepare concrete surfaces according to ICRI 310.2R, between CSP 3 and CSP 5, as required by the matrix manufacturer.
- C. Acid etching is not acceptable.
- D. Prepare wood subfloor, tape joints, and apply subfloor joint filler.
- E. Apply primer in accordance with manufacturer's instructions.

3.4 INSTALLATION

- A. Install control joint strips straight and flat to locations indicated.
- B. Install divider strips according to pattern approved on shop drawings.
- C. Install accessory strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
- D. Place terrazzo mix over substrate to thickness indicated.

3.5 FINISHING

- A. Finish terrazzo to NTMA requirements.
- B. Produce terrazzo finish surface to match approved mock-up, with 70 percent chip exposed.
- C. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method.
 - 1. Cleanse floor after rough grinding and fill voids with epoxy matrix.
 - 2. Allow grout to cure; grout may be left on terrazzo until other trades work is completed.
 - 3. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- D. Polishing: Grind with 120 grit or finer stones until all grout is removed from surface. Repeat rough grinding, grout coat and polishing if large terrazzo chip voids exist after initial polishing.
- E. Apply grout to fill voids exposed from grinding.
- F. Surface Finishing:
 - 1. Cleanse floor after polishing and remove latency and particulate matter; use neutralizing cleaner and allow to dry.
 - 2. Continue polishing process with diamond grits 220.
 - 3. Inspect entire surface for consistent appearance, manifesting no abrasion scratches from previous grits.
- G. Hand grind vertical and curved surfaces similarly.

3.6 TOLERANCES

- A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.
- B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.7 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.8 FIELD QUALITY CONTROL

- A. Testing - Dynamic Coefficient of Friction, ANSI/NFSI B101.3: Minimum 0.5 for walkway surfaces.
- B. Report test results in writing to Owner, Contractor, and Architect within 24 hours after tests.

3.9 CLEANING

- A. Scrub and clean terrazzo surfaces with neutral pH cleaner in accordance with manufacturer's instructions. Let dry.
- B. Immediately after terrazzo has dried, apply sealer in accordance with manufacturer's instructions.
 - 1. Apply minimum two sealer coats.

C. Polish surfaces in accordance with manufacturer's instructions.

3.10 PROTECTION

A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.

END OF SECTION

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SECTION 09 68 13 TILE CARPETING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.2 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. CRI 104 - Standard for Installation of Commercial Carpet.
- C. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate layout of joints.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D. Submit two, 18 inch long samples of edge strip.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed, with a minimum of 1 full box of each type, color, and pattern.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing carpet tile with minimum five years documented experience and approved by carpet tile manufacturer and approved by carpet tile manufacturer.
 - 1. Installers trained, accepted and certified by the carpet manufacturer, or FCIB, IFCI or CRI certified carpet installers.

1.5 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Basis-of-Design: Patcraft.
- B. Other Approved Manufacturers:
 - 1. Milliken.
 - 2. Shaw Contract.
 - 3. Interface.
- C. <Double click here to find, evaluate, and insert list of manufacturers and products.>

- D. Color: Basis-of-Design: As selected from Inclusion Color or Surface Striations color lines.
- E. Pattern: Basis-of-Design: Gemscape.
- F. Fiber Content: 100 percent nylon 6.
- G. Pile Characteristic: multi-level pattern loop.
- H. Density: 4966 oz./cu. yd..
- I. Stitches: 10.83 per inch.
- J. Gage: 0.1 per inch.
- K. Primary Backing/Backcoating: Patcraft StrataWorx Tile.
- L. Size: 24 by 24 inches.
- M. Applied Treatments:
 - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
 - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

2.2 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
 - 1. At locations adjacent tile finish, provide feathered subfloor filler at carpet tile to align with the tile surface; feathered distance from metal edge strip, to a distance of one unit of carpet tile.
- B. Edge Strips: Rubber, color as selected by Architect.
- C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface; prohibit traffic until filler is cured. Provide feathered subfloor filler at carpet tile to align with the tile surface; feathered distance from metal edge strip, to a distance of one unit of carpet tile.
- C. Vacuum clean substrate.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
- I. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Primers.
 - 2. Water-based finish coatings.
 - 3. Dry fall coatings.
- B. Project includes painted murals or graphics within event spaces; following application of specified interior paint system, apply graphics with specified top coat and the use of precision cut masking films manufactured especially for paint masking - similar to court graphics.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include preparation requirements and application instructions.
 - 2. Indicate VOC content.
- B. Samples: For each type of topcoat product.
- C. Samples for Initial Selection: For each type of topcoat product.
- D. 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.
- E. Product Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 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.

1.6 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 of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 PAINT PRODUCTS, 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. Twenty percent of surface area will be painted with deep tones.

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: 12 percent.
 3. Wood: 15 percent.
 4. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.

- B. Remove hardware, covers, plates, 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 but not less than the following:
 - 1. SSPC-SP 3.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. 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 INSTALLATION

- A. Apply paints according to manufacturer's written instructions.
 - 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. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - i. Refer to MEP for additional items.
 - 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.
 - i. Refer to MEP for additional items.
 - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
 - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 - 3. Allow empty paint cans to dry before disposal.
 - 4. Collect waste paint by type and deliver to recycling or collection facility.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete and Masonry Other Than Concrete Masonry Units:

1. Semi-Gloss Sheen:

a. Benjamin Moore & Co.:

- 1) Primer (Unpainted Surfaces): Ultra Spec Masonry Int/Ext Acrylic Sealer (608).
- 2) First and Second Coats: Ultra Spec 500 Waterborne Zero VOC Semi-Gloss N539.

b. Behr Process Corporation:

- 1) Primer: Multi-Surface Interior/Exterior Primer & Sealer, 436
- 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, PR370

c. PPG Paints:

- 1) Primer (Unpainted Surfaces): Speedhide Zero Int. Latex Quick Drying Primer/Sealer, 6-4900XI.
- 2) First and Second Coats: Speedhide Zero Interior Flat Latex, 6-4510XI.

d. Sherwin-Williams Company:

- 1) Primer (Unpainted Surfaces): Loxon Concrete and Masonry Primer LX02 Series.
- 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2650 Series.

e. McCormick Paints:

- 1) Primer (Unpainted Surfaces): Acrylok Interior/Exterior 100% Acrylic Masonry Primer 06451.
- 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Semi-Gloss 10 Series.

B. Concrete Masonry Units:

1. Semi-Gloss Sheen:

a. Benjamin Moore & Co.:

- 1) Block Filler (Unpainted Surfaces) - 2 Coats: Ultra Spec Hi-Build Masonry Block Filler (571).
- 2) First and Second Color Coats: Ultra Spec 500 Waterborne Interior Semi-Gloss N539.

b. Behr Process Corporation:

- 1) Block Filler (Unfinished Surfaces) - 2 Coats: Behr Pro Block Filler Primer, PR50
- 2) First and Second Color Coats: Behr Pro i300 Interior Semi-Gloss Paint, PR370

c. PPG Architectural Coatings; PPG Paints:

- 1) Block Filler (Unpainted Surfaces) - 2 Coats: Speedhide Latex Block Filler 6-15XI.

- 2) First and Second Color Coats: Speedhide Zero Interior Semi-Gloss Latex Enamel, 6-4510XI Series.
 - d. Sherwin-Williams Company:
 - 1) Block Filler (Unpainted Surfaces) - 2 Coats: Conflex Block Filler CF1W50.
 - 2) First and Second Color Coats: ProMar 200 Zero VOC Interior Latex S/G, B31-2650 Series.
 - e. McCormick Paints:
 - 1) Block Filler (Unpainted Surfaces) - 2 Coats: McCormick Interior/Exterior Latex Block Filler 01015.
 - 2) First and Second Color Coats: McCormick Total Advantage Zero VOC Professional Coating Semi-Gloss 10 Series.
- C. Gypsum Board:
- 1. Flat Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unpainted Surfaces): Ultra Spec 500 Waterborne Zero VOC Primer Sealer N534.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Zero VOC Flat N536.
 - b. Behr Process Corporation:
 - 1) Primer (Unpainted Surfaces) Drywall Plus Interior Drywall Primer & Sealer, 73
 - 2) First and Second Coats: Behr Pro i300 Interior Flat Paint, 310
 - c. PPG Paints:
 - 1) Primer (Unpainted Surfaces): Speedhide Zero Int. Latex Quick Drying Primer/Sealer, 6-4900XI.
 - 2) First and Second Coats: Speedhide Zero Interior Flat Latex I, 6-4110XI Series.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unpainted Surfaces): ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex Flat, B30-2650 Series.
 - e. McCormick Paints:
 - 1) Primer (Unpainted Surfaces): McCormick 1st Step Interior Vinyl Primer Sealer 06431.
 - 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Flat 08 Series.
 - 2. Low-Luster, Satin or Eggshell Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unfinished Surfaces): Ultra Spec 500 Waterborne Interior Primer Sealer N534.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Zero VOC Eggshell Enamel N538.
 - b. Behr Process Corporation:
 - 1) Primer (Unpainted Surfaces) Drywall Plus Interior Drywall Primer & Sealer, 73
 - 2) First and Second Coats: Behr Pro i300 Interior Eggshell Paint, 330
 - c. PPG Paints:

- 1) Primer (Unfinished Surfaces): Speedhide Zero Latex Quick Drying Primer/Sealer, 6-4900XI.
 - 2) First and Second Coats: Speedhide Zero Interior Eggshell Latex 6-4310XI Series.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unfinished Surfaces): ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2650 Series.
 - e. McCormick Paints:
 - 1) Primer (Unpainted Surfaces): McCormick 1st Step Interior Vinyl Primer Sealer 06431.
 - 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Eggshell 09 Series.
3. Microbicidal Paint (Eggshell Sheen)
- a. Benjamin Moore & Co.:
 - 1) Primer: (Unpainted Surface) Ultra Spec Masonry Int/Ext Acrylic Sealer 608.
 - 2) First and Second Color Coats: Eco Spec WB Silver Interior Latex Eggshell Finish 474.
 - b. Sherwin-Williams Company:
 - 1) Primer: ProMar 200 Zero VOC Primer B28W2600.
 - 2) First and Second Coats: Paint Shield Interior Latex Eg-Shel Microbicidal Paint D12W51; 4.0 mil thickness each coat.
- D. Woodwork and Hardboard - Painted:
1. Semi-Gloss Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Undercoat (Unfinished Surfaces): Fresh Start 100% Acrylic Superior Primer 023.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Interior Zero VOC Semi-Gloss 539.
 - b. Behr Process Corporation:
 - 1) Primer (Unpainted Surfaces): Drywall Plus Interior Drywall Primer & Sealer, 73
 - 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, 370
 - c. PPG Architectural Coatings; PPG Paints:
 - 1) Undercoat (Unfinished Surfaces): 17-921 Seal Grip Interior/Exterior Acrylic Universal Primer.
 - 2) First and Second Coats: Speedhide Zero Interior Semi-Gloss Latex Enamel, 6-4510XI Series.
 - d. Sherwin-Williams Company:
 - 1) Undercoat (Unfinished Surfaces): PrepRite ProBlock Latex Primer/Sealer B51W620.
 - 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex S/G, B31-2600 Series; or Pro Industrial Acrylic Coating S/G B66-650.
 - e. McCormick Paints:
 - 1) Undercoat (Unpainted Surfaces): McCormick Unix Multi-Purpose Stain Blocking Interior/Exterior Primer 06460.

- 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Semi-Gloss 10 Series.
- E. Mechanical and Electrical Items: Use 3-coat system best suited to substrate, satin finish. Use heat resistant materials where required.
- F. Ferrous Metal:
 1. Semi-Gloss Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unfinished Surfaces): Ultra Spec HP Acrylic Metal Primer HP04.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Interior Semi-Gloss 539.
 - b. Behr Process Corporation:
 - 1) Primer (Unfinished Surfaces): Multi-Surface Interior/Exterior Primer & Sealer, 436
 - 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, 370
 - c. PPG Paints:
 - 1) Primer (Unfinished Surfaces): Pitt Tech Plus 4020 PF
 - 2) First and Second Coats: Speedhide Zero Interior Semi-Gloss Latex Enamel, 6-4510XI Series.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unfinished Surfaces): Pro-Cryl Universal Primer, B66-1310 Series.
 - 2) First and Second Coats: Pro Industrial Acrylic Coating S/G, B66-650.
 - e. McCormick Paints:
 - 1) Primer (Unfinished Surfaces): McCormick Unix Multi-Purpose Stain Blocking Interior/Exterior Primer 06460.
 - 2) First and Second Coats: McCormick Interlok Interior/Exterior Acrylic Semi-Gloss Urethane DTM 45 Series.
 2. Microbicidal Paint (Eggshell Sheen)
 - a. Benjamin Moore & Co.:
 - 1) Primer: (Unfinished Surfaces): Ultra Spec HP Acrylic Metal Primer HP04.
 - 2) First and Second Coats: Eco Spec WB Silver Interior Latex Eggshell Finish 474.
 - b. Sherwin-Williams Company:
 - 1) Primer: Pro Industrial Pro-Cryl Universal Acrylic Primer B66-1310 Series.
 - 2) First and Second Coats: Paint Shield Interior Latex Eg-Shel Microbicidal Paint D12W51; 4.0 mil thickness each coat.
 3. Pigmented Polyurethane over Zinc-Rich and Epoxy System: High contact/high traffic areas such as, but not limited to doors and frames, stair risers, and railings.
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech 100% Solids Epoxy Pre-Primer V155.
 - 2) Intermediate Coat: Ultra Spec HP Acrylic Metal Primer HP04.
 - 3) Topcoat - Semi-gloss: Coronado Rust Scat Waterborne Acrylic Enamel C90.
 - b. International Paint LLC:
 - 1) Prime Coat: Catha-Coat 302H.
 - 2) Intermediate Coat: Bar-Rust 231 Series.
 - 3) Topcoat - Semi-Gloss: Devthane378 Series.
 - c. PPG Paints:

- 1) Prime Coat: 4020 PF.
 - 2) Intermediate Coat: PITT-GLAZE® WB1 Interior Pre-Catalyzed Water-Borne Acrylic Epoxy.
 - 3) Topcoat: PITT-GLAZE® WB1 Interior Pre-Catalyzed Water-Borne Acrylic Epoxy.
- d. Sherwin-Williams Company:
- 1) Prime Coat: Pro Industrial Pro-Cryl Universal Acrylic Primer B66-1310.
 - 2) Intermediate Coat: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
 - 3) Topcoat: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
- e. Tnemec Company, Inc.:
- 1) Prime (Shop) Coat: Series 94H2O Hydro-Zinc. Refer to applicable Division 05 Sections.
 - 2) Intermediate Coat: Series 287 Enviro-Pox.
 - 3) Topcoat - Semi-Gloss: Series 248-clear Everthane.
- G. Zinc-Coated (Galvanized) Metal:
1. Semi-Gloss Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unfinished Surfaces): Ultra Spec HP Acrylic Metal Primer HP04.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Interior Semi-Gloss 539.
 - b. Behr Process Corporation:
 - 1) Primer (Unfinished Surfaces): Multi-Surface Interior/Exterior Primer & Sealer, 436
 - 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, 370
 - c. PPG Paints:
 - 1) Primer (Unfinished Surfaces): Pitt Tech Plus 4020PF
 - 2) First and Second Coats: Speedhide Zero Interior Semi-Gloss Latex Enamel, 6-4510XI Series.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unfinished Surfaces): ProCryl Universal Primer, B66-1310 Series.
 - 2) First and Second Coats: ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, or Pro Industrial Acrylic Coating Semi-Gloss, B66-650.
 - e. McCormick Paints:
 - 1) Primer (Unfinished Surfaces): McCormick Unix Multi-Purpose Stain Blocking Interior/Exterior Primer 06460.
 - 2) First and Second Coats: McCormick Interlok Interior/Exterior Acrylic Semi-Gloss Urethane DTM 45 Series.
 2. Pigmented Polyurethane over Zinc-Rich and Epoxy System: High contact/high traffic areas such as, but not limited to doors and frames (including exterior side of exterior doors and frames) stair risers, and railings.
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech 100% Solids Epoxy Pre-Primer V155.
 - 2) Intermediate Coat: Ultra Spec HP Acrylic Metal Primer HP04.
 - 3) Topcoat - Semi-gloss: Coronado Rust Scat Waterborne Acrylic Enamel C90.
 - b. International Paint LLC:
 - 1) Prime Coat: Catha-Coat 302H.
 - 2) Intermediate Coat: Bar-Rust 231 Series.

- 3) Topcoat - Semi-Gloss: Devthane378 Series.
- c. PPG Paints:
 - 1) Prime Coat: 4020 PF.
 - 2) Intermediate Coat: PITT-GLAZE® WB1 Interior Pre-Catalyzed Water-Borne Acrylic Epoxy.
 - 3) Topcoat: PITT-GLAZE® WB1 Interior Pre-Catalyzed Water-Borne Acrylic Epoxy.
- d. Sherwin-Williams Company:
 - 1) Prime Coat: Pro Industrial Pro-Cryl Universal Acrylic Primer B66-1310.
 - 2) Intermediate Coat: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
 - 3) Topcoat: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
- e. Tnemec Company, Inc.:
 - 1) Prime (Shop) Coat: Series 94H2O Hydro-Zinc. Refer to applicable Division 05 Sections.
 - 2) Intermediate Coat: Series 287 Enviro-Pox.
 - 3) Topcoat - Semi-Gloss: Series 248-clear Everthane.
- H. Overhead Exposed Construction (Deck, Joists, Steel) - Typical: One coat flat dry fallout coating system to cover formulated for compatibility with all substrates by any paint manufacturer specified in this Section. Use 100 percent acrylic, flash-rust-resistance dryfall.
 1. Benjamin Moore & Co.: Benjamin Moore Latex Dry Fall- Flat (395).
 2. Behr: Behr Pro Dryfall Paint Flat, 890
 3. PPG Paints: Speedhide Super Tech WB Interior 100% Acrylic Dry-Fog Latex 6-725XI.
 4. Sherwin-Williams Company: Pro Industrial Waterborne Acrylic Dryfall Flat, B42W00181.
 5. McCormick Paints: Interior Waterborne Acrylic Dry Fall 01219.
- I. Overhead Exposed Construction (Deck, Joists, Steel) - High-humidity Spaces: Refer to Division 9 Section, "High-Performance Coatings;" high humidity spaces include, but not limited to, gang toilets and locker rooms open to gang showers.
- J. Cotton or Canvas Insulation-Covering Substrates, Including Pipe and Duct Coverings:
 1. Benjamin Moore & Co.:
 - a. Primer: Ultra Spec 500 Interior Zero VOC Latex Primer N534.
 - b. First and Second Coats: Ultra Spec 500 Interior Zero VOC Latex Eggshell, N538.
 2. Behr Process Corporation:
 - a. Primer: Kilz 2 Interior/Exterior Water-Base Primer, 2000
 - b. First and Second Coats: Behr Pro i300 Interior Eggshell Paint, PR330
 3. PPG Paints:
 - a. Primer: Speedhide Zero Int. Latex Quick Drying Primer/Sealer, 6-4900XI.
 - b. First and Second Coats: Speedhide Zero Interior Eggshell Latex Enamel, 6-4310XI Series.
 4. Sherwin-Williams Company:
 - a. Primer: PrepRite ProBlock Latex Primer/Sealer, B51W620.
 - b. First and Second Coats: ProMar 200 Zero VOC Latex Eg-Shel, B202600 Series.
 5. McCormick Paints:
 - a. Top Coat: McCormick Total Advantage Zero VOC Professional Coating Eggshell 09 Series.
- K. Exposed PVC Piping:
 1. Benjamin Moore & Co.:

- a. Bond Coat: STIX Waterborne Bonding Primer SXA-110; Insl-X.
 - b. First and Second Coats: Ultra Spec 500 Interior Zero VOC Latex Eggshell, 538.
2. Behr Process Corporation:
 - a. Primer: Multi-Surface Interior/Exterior Primer & Sealer, 436.
 - b. First and Second Coats: Behr Pro i300 Interior Eggshell Paint, PR330.
3. PPG Paints:
 - a. Bond Coat: SEAL GRIP 17-921 Interior/Exterior 100% Acrylic Universal Primer/Sealer.
 - b. First and Second Coats: Speedhide Zero Interior Eggshell Latex Enamel, 6-4310XI Series.
4. Sherwin-Williams Company:
 - a. Bond Coat: PrepRite ProBlock Latex Primer/Sealer, B51W620.
 - b. First and Second Coats: ProMar 200 Zero VOC Latex Eg-Shel, B202600 Series.
5. McCormick Paints:
 - a. Prime Coat: McCormick Unix Multi-Purpose Stain Blocking Interior/Exterior Primer 06460.
 - b. Top Coat: McCormick Total Advantage Zero VOC Professional Coating Eggshell 09 Series.

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SECTION 10 11 00 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Visual display board assemblies.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
 - 2. Include electrical characteristics for motorized units.
- B. Shop Drawings: For visual display units.
 - 1. Include plans, elevations, sections, details, and attachment to other work.
 - 2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
 - 3. Show locations and layout of special-purpose graphics.
 - 4. Include sections of typical trim members.
 - 5. Include wiring diagrams for power and control wiring.
- C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
 - 1. Samples of facings for each visual display panel type, indicating color and texture.
 - 2. Fabric swatches of fabric facings for tackboards.
 - 3. Actual factory-finish color samples, applied to **[aluminum]** **[wood]** substrate.
 - 4. Include accessory Samples to verify color selected.
- D. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each visual display unit, for tests performed by a qualified testing agency.
- C. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For visual display units to include in maintenance manuals.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period: 50 years from date of Substantial Completion.
 - 3. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 VISUAL DISPLAY BOARD ASSEMBLY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A-1 Visual Systems.
 - 2. AARCO Products, Inc.
 - 3. ADP Lemco.
 - 4. AJW Architectural Products.
 - 5. Architectural School Products Ltd.
 - 6. Aywon.
 - 7. Bangor Cork Company, Inc.
 - 8. CIG-JAN Products, Ltd.
 - 9. Claridge Products and Equipment, Inc.
 - 10. Delta Products, Ltd.
 - 11. Egan Visual Inc.
 - 12. Everase, Inc.
 - 13. EverWhite.
 - 14. Ghent Manufacturing, Inc.
 - 15. K-Pro Specialty Products.
 - 16. Marsh Industries, Inc.
 - 17. MooreCo, Inc.
 - 18. Nudo Products, Inc.
 - 19. Panel Processing, Inc.
 - 20. Peter Pepper Products, Inc.
 - 21. Platinum Visual Systems.
 - 22. PolyVision Corporation.
 - 23. Shanahan's Manufacturing Limited.

- B. Visual Display Board Assembly: factory fabricated.
 - 1. Assembly: Markerboard and tackboard.
 - 2. Corners: Square.
 - 3. Width: As indicated on Drawings.
 - 4. Height: As indicated on Drawings.
 - 5. Mounting Method: Direct to wall.
- C. Markerboard Panel (Type MB): Porcelain-enamel-faced markerboard panel on core indicated.
 - 1. Color: White.
- D. Tackboard Panel (Type TB): Plastic-impregnated-cork tackboard panel on core indicated.
 - 1. Color and Pattern: As selected by Architect from full range of industry colors.
- E. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; slim size and standard shape.
 - 1. Aluminum Finish: Clear anodic finish.
- F. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
- G. Combination Assemblies: Provide hidden spline between abutting sections of visual display panels.
- H. Chalktray: Manufacturer's standard; continuous.
 - 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
- I. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, designed to hold accessories.
 - 1. Size: 1 inch high by full length of visual display unit.
 - 2. Map Hooks: Two map hooks for every 48 inches of display rail or fraction thereof.
 - 3. Flag Holder: One for each room.
 - 4. Tackboard Insert Color: As selected by Architect from full range of industry colors.
 - 5. Aluminum Color: Match finish of visual display assembly trim.

2.3 MARKERBOARD PANELS

- A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with high -gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
 - 1. Face Sheet Thickness: Manufacturers standard uncoated base metal thickness.
 - 2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
 - 3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.4 TACKBOARD PANELS

- A. Tackboard Panels:
 - 1. Facing: 1/4-inch- thick, plastic-impregnated cork.
 - a. Up to three colors will be required for this project.
 - 2. Core: Manufacturer's standard.

2.5 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

- B. Plastic-Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout; with surface-burning characteristics indicated.
- C. Hardboard: ANSI A135.4, tempered.
- D. Particleboard: ANSI A208.1, Grade M-1.
- E. MDF: ANSI A208.2, Grade 130.
- F. Fiberboard: ASTM C208 cellulosic fiber insulating board.
- G. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- H. Extruded Aluminum: ASTM B221, Alloy 6063.
- I. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
- J. Primer/Sealer: Mildew-resistant primer/sealer and recommended in writing by visual display unit manufacturer for intended substrate.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prime wall surfaces as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
 - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 11 00

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SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as toilet enclosures.

1.2 COORDINATION

- A. Coordinate requirements for overhead supports, blocking, reinforcing, and other supports concealed within wall.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Solid-plastic toilet compartments:
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For solid-plastic toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show overhead support or bracing locations.
5. .

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Product Certificates: For each type of toilet compartment by manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: Three hinge(s) with associated fasteners.
2. Latch and Keeper: Three latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: Three bumper(s) with associated fasteners.
4. Door Pull: Three door pull(s) with associated fasteners.
5. Fasteners: 10 fasteners of each size and type.
6. Occupancy Indicators: Provide on each door.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Department of Justice "2010 ADA Standards for Accessible Design" and ICC A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basis-of-Design: Hiny Hiders by Scranton Products.
 - 2. Accurate Partitions Corp., an ASI Group Company.
 - 3. AJW Architectural Products.
 - 4. American Sanitary Partition Corporation.
 - 5. Ampco by AJW.
 - 6. General Partitions Mfg. Corp.
 - 7. Global Partitions Corp., an ASI Group Company.
 - 8. Hadrian Manufacturing Inc.
 - 9. Marlite.
 - 10. PSISC.
 - 11. Weis-Robart Partitions, Inc.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.
- D. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- E. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
- F. Overhead Cross Bracing for Ceiling-Hung Units: As recommended by manufacturer and fabricated from solid polymer.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories, Standard Duty: Manufacturer's standard operating hardware and accessories.
 - 1. Material: Stainless steel.
 - 2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.
 - 3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit, designed for emergency access, and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.

5. Door Bumper: Manufacturer's standard rubber-tipped bumper at outswinging doors.
 6. Door Pull: Manufacturer's standard unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
 - C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.
- 2.4 MATERIALS
- A. Aluminum Castings: ASTM B26/B26M.
 - B. Aluminum Extrusions: ASTM B221.
 - C. Brass Castings: ASTM B584.
 - D. Brass Extrusions: ASTM B455.
 - E. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
 - F. Stainless Steel Castings: ASTM A743/A743M.
 - G. Zamac: ASTM B86, commercial zinc-alloy die castings.
- 2.5 FABRICATION
- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
 - B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
 - C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, inswinging doors for standard toilet compartments and 36-inch- wide, outswinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PLASTIC TOILET COMPARTMENTS

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.
- 3.3 ADJUSTING
- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13.19

SECTION 10 21 23 - CUBICLE CURTAINS AND TRACK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cubicle-curtain support systems.
 - 2. Cubicle curtains.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For each type of curtain fabric indicated, include durability, laundry temperature limits, fade resistance, applied curtain treatments, and fire-test-response characteristics.
- B. Shop Drawings: For curtains and tracks.
 - 1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
 - 2. Include details of blocking for track support.
- C. Samples: For each exposed product and for each color and texture specified, 10 inches in size.
- D. Samples for Initial Selection: For each type of curtain material indicated.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For curtains, tracks, and hardware to include in operation and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Curtain Carriers and Track End Caps: Full-size units equal to 3 percent of amount installed for each size indicated, but no fewer than two units.
 - 2. Curtains: Full-size units, provide two units.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Cubicle Curtains: Provide curtain fabrics with the following characteristics:
 - 1. Laundering: Launderable to a water temperature of not less than 160 deg F.
 - 2. Flame Resistance: Provide fabrics identical to those that have passed NFPA 701 when tested by a qualified testing agency acceptable to authorities having jurisdiction.
 - a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CUBICLE-CURTAIN SUPPORT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AR Nelson.
 - 2. Automatic Devices Company.
 - 3. Imperial Fastener Company, Inc.
 - 4. inpro Corporation.

- B. Extruded-Aluminum Curtain Track: Not less than 5/8 inch wide by 1/2 inch high.
 - 1. Track Minimum Wall Thickness: Manufacturer's standard.
 - 2. Curved Track: Factory-fabricated, 12-inch- radius bends.
 - 3. Finish: Clear anodized.
- C. Curtain-Track Mounting: Suspended.
- D. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
 - 1. Suspended-Track Support: Not less than 5/8-inch- square tube.
 - 2. End Stop: Removable with carrier hook.
 - 3. Switch Unit: Shuttle and coupling device for rerouting and securing cubicle curtain, with pull chain for switching track.
- E. Curtain Roller Carriers: Two nylon rollers and nylon axle with chrome-plated steel hook.
- F. Exposed Fasteners: Stainless steel.
- G. Concealed Fasteners: Stainless steel.

2.3 CUBICLE CURTAINS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AR Nelson.
 - 2. Automatic Devices Company.
 - 3. Imperial Fastener Company, Inc.
 - 4. inpro Corporation.
- B. Fabric: Curtain manufacturer's standard, 100 percent polyester; inherently and permanently flame resistant, stain resistant, and antimicrobial.
 - 1. Pattern: As selected by Architect from manufacturers full range.
 - 2. Width: Refer to drawings.
 - 3. Color: As selected by Architect from manufacturer's full range.
- C. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.
- D. Mesh Top: Not less than 20-inch- high mesh top.
 - 1. Mesh: No. 50 nylon mesh.
- E. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

2.4 CURTAIN FABRICATION

- A. Continuous Curtain Panels:
 - 1. Width: Equal to track length from which curtain is hung plus 10 percent of added fullness, but not less than 12 inches of added fullness.
 - 2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor of 12 inches.
 - 3. Mesh Top: Top hem of mesh not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to 1/2-inch triple thickness, top hem of curtain fabric.
 - 4. Bottom Hem: Not less than 1 inch and not more than 1-1/2 inches wide, lockstitched.
 - 5. Side Hems: Not less than 1/2 inch and not more than 1-1/4 inches wide, with turned edges, and single lockstitched.
 - 6. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install tracks level and plumb, according to manufacturer's written instructions.
- B. For tracks of up to 20 feet in length, provide track fabricated from single, continuous length.
- C. Track Mounting:
 - 1. Surface-Track: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
 - 2. Mechanically fasten directly to finished ceiling with toggle bolts or manufacturer's proprietary clip.
- D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
- E. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.
- F. Cubicle Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

END OF SECTION 10 21 23

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SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
 - 3. Childcare accessories.
 - 4. Custodial accessories.

1.2 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- B. Samples: For each exposed product and for each finish specified, full size.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.
- D. Delegated-Design Submittal: For grab bars and shower seats.
 - 1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

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

1.6 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
 - 2. Shower Seats: Installed units are able to resist 250 lbf applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Design for each type of accessory is based on products indicated on Drawings.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Source Limitations: Obtain public-use shower room accessories from single source from single manufacturer.
- B. Design for each type of accessory is based on products indicated on Drawings.

2.4 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.
- B. Custodial Mop and Broom Holder Insert drawing designation:
 - 1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 - 2. Length: 36 inches.
 - 3. Hooks: Four.
 - 4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
 - 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
 - b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.5 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- C. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).
- D. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.6 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

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SECTION 11 00 05 - MISCELLANEOUS EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes equipment not specified in other sections of the Project Manual.
- B. Furnish labor, materials, tools, equipment, services and supervision required to complete Work, including all incidental and complementary Work shown, specified or necessary to complete Work.
- C. Make all final connections for products included in this Section.
- D. Section includes:
 - 1. Large Format Video Screen with Mount.

1.2 SUBMITTALS

- A. Shop Drawings: Indicate locations, construction and anchorage details, dimensions and rough-in opening sizes.
- B. Product Data: Submit data for furnishings describing size, color and finish, details of function and attachment methods.
- C. Samples:
 - 1. When directed by the Architect, furnish samples showing full color range and other features of the product.
 - 2. Where applicable, furnish one of each type wall clip or anchoring device to install product to the building construction.
- D. Certify in writing that each product meets the specifications and can be installed in building where scheduled; certifications shall be produced and submitted following verification of site conditions.
- E. Submit operation and maintenance data for electrically operated equipment.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum five years experience.

1.4 PROJECT CONDITIONS

- A. Verify measurements in field as required for Work fabricated to fit job conditions.
- B. Before ordering items or fabrication of Work, examine Drawings, job conditions, to assure good fit, neat installation.

PART 2 - PRODUCTS

2.1 LARGE FORMAT VIDEO SCREEN

- A. Basis-of-Design: Samsun Model QN85QN85AAFZXA.
- B. Size: 85 inches.
- C. Type: Smart TV,
- D. Screen Type: Neo QLED.
- E. Resolution: 4K UHD.
- F. Wall Mount:

1. Basis-of-Design: Sanus Elite Series, Model BXT3-B1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Order items in ample time so as not to delay job progress with delivery at job site coordinated with other Work.
- B. Install in a thorough, workmanlike manner, in strict accordance with manufacturer's printed instructions and subject to inspection by the Architect.
- C. Assembly:
 1. Deliver factory-built units completely assembled in one piece without joints, whenever possible.
 2. Where dimensions exceed unit size, provide two or more pieces of equal length as acceptable to Architect and Owner.
 3. When overall dimensions require delivery in separate units, prefit at factory, disassemble for delivery, and make final joints at site.
 4. Use splines at joints to maintain surface alignment.
- D. Install units in locations and mounting heights as shown on Drawings, keeping perimeter lines straight, plumb and level.
- E. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories for complete installation.
- F. Coordinate job-assembled units with grounds, trim and accessories; join all parts with neat, precision fit.
- G. Verify accessories required for each unit properly installed and operating units properly functioning.

3.2 CLEANUP

- A. Remove temporary protective cover at completion.

END OF SECTION 11 00 05

SECTION 12 10 13.55 - MURALS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Custom murals.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Shop Drawings: Include elevations of graphics with numbered panel installation sequence.
 - 1. Samples for Verification: 36-inch wide by full height, 1/4-scale of full mural.
- C. Qualification Data: For installer and graphics printer.
- D. Product Certificates: For each component of mural system specified, signed by product manufacturer certifying compliance with specifications and suitability of product for intended use.
- E. Graphic Printer Certificates: Signed by graphic printer certifying that they comply with requirements and that products used to produce graphic are same products submitted, as product data and samples, for review and accepted by Architect.
- F. Maintenance Data: For film to include in maintenance manuals.
- G. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by film manufacturer, experienced in applying film 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. Graphics Printer Qualifications: Printing company capable of demonstrating ability to produce large scale graphic image, and experienced in producing graphics on film similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of at least three previous projects successful in-service performance similar in size and scope as indicated for this Project.
- C. Single-Source Responsibility: Provide all components required for system specified, including inks and toner, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide film with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install film until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install film until a permanent level of lighting is provided on the surfaces to receive film.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of murals that fail in performance, materials, or workmanship within specified warranty period.
 - 1. Failures in materials include, but are not limited to, premature graphic failure due to excessive fading, discoloration, crazing, peeling and blistering, or excessive dimensional change or loss of adhesion that make the graphic visually unacceptable when viewed from the intended viewing distance.
 - 2. Warranty Period: Eight years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Basis-of-Design Products: The design for each mural component specified is based on the product specified. Subject to compliance with requirements, provide either the named product or a comparable product by another manufacturer accepted by the Architect prior to bid.
- B. Approved Printer and Installers:
 - 1. Vomela the Imagemakers, 1-800-645-1012.
 - 2. Acorn Sign Graphics: www.acornsign.com.

2.2 MURAL PRODUCTS

- A. General: Provide custom graphics on wallcovering based on the following products:
- B. Manufacturer: 3M.
 - 1. Graphic Film:
 - a. Basis-of-Design Product: 3M; Controltac Plus Graphic Film 8620 ES.
 - b. Description: 3- to 4-mil thick, self-adhering sheet consisting of 2-mil-thick white opaque vinyl with release liner on adhesive side.
 - 1) Tensile Strength: 5 lb./ in. at 73 deg F.
 - 2) Applied Shrinkage: 0.015 inch.
 - 3) Service Temperature: 0 to 120 deg F minimum
 - c. Adhesive Type and Color: Repositionable, pressure activated; gray.
 - d. Roll Length: 50 yards minimum.
 - e. Width: 54 inches.
 - 2. Protective Laminate Film:
 - a. Basis-of-Design Product: 3M; Scotchcal Matte Overlamine 8911 ES.
 - b. Description: 3- to 4-mil thick, self-adhering sheet consisting of 1-mil-thick transparent polyester with release liner on adhesive side.
 - 1) Tensile Strength: 13 lb./ in. at 73 deg F.

- 2) Applied Shrinkage: 0.015 inch.
 - 3) Service Temperature: 0 to 120 deg F minimum.
 - 4) Chemical Resistance: Resists mild alkalis, mild acids and salts.
 - c. Adhesive Type and Color: Pressure sensitive; clear.
 - d. Roll Length: 50 yards minimum.
 - e. Width: 49-1/2 inches.
 - f. Colors, Textures, and Patterns: Clear, smooth.
 3. Color Agents:
 - a. Basis-of-Design Product: 3M; Scotchprint Exterior Four Color Toner Series 8700/8800 and Trident Transfer Media ES.
 - b. Description: Four color electrostatic printing utilizing toners and image transfer media as recommended by manufacturer.
 - c. Colors, Textures, and Patterns: To be provided by Architect.
 - C. Manufacturer: Eykon Wallcovering Source.
 1. Graphic Film: 20 oz. Osnaburg
 - a. Total Weight: 13.3 oz/sq. yd.
 - b. Vinyl Weight: 11.3 oz/sq. yd.
 - c. Tensile Strength: 44 x 41.
 - d. Type II.
 2. Color Agents: Manufacturer's standard.
 - a. Colors, Textures, and Patterns: To be provided by Architect.
- 2.3 ACCESSORIES
- A. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Division 9 Section "Painting" and recommended in writing by graphic film manufacturer for intended substrate.
 - B. Application Tape: As recommended by film manufacturer.
- 2.4 FABRICATION
- A. General: Fabricate film panels in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.
 - B. Graphics: Custom graphics to be provided by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair graphic film's bond, including mold, mildew, oil, grease, incompatible primers, dirt, and dust.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.

2. Gypsum Board: Prime with primer recommended by graphic film manufacturer.
 3. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION

- A. General: Comply with film manufacturer's written installation instructions applicable to products and applications indicated, except where more stringent requirements apply; perform work with a named approved installer.
- B. Install graphic film and protection film with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage or scratches.
- C. Match pattern. Match panels within each separate area by the following method:
1. Sequence-matched, sizes as indicated on approved Shop Drawings.
- D. Install seams vertical and plumb. No horizontal seams are permitted.
- E. Fully bond graphic film to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- F. Fully bond protective laminate film to graphic film. Remove air bubbles, wrinkles, blisters, and other defects.
- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

- A. Use cleaning methods recommended in writing by film manufacturer.
- B. Replace strips that cannot be cleaned.
- C. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 12 24 13 - WINDOW SHADE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes room darkening and light blocking roller shades.
- B. Review to Drawings for locations of manual and motorized roller shades.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
 - 1. Motorized Shade Operators: Include operating instructions.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
 - 1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - 2. Wiring Diagrams: Power, system, and control wiring.
- C. Samples for Initial Selection: For each colored component of each type of shade indicated.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification:
 - 1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
 - 2. For the following products:
 - a. Shade Material: Not less than 3 inches square, with specified treatments applied. Mark face of material.
 - b. Fascia: Full-size unit, not less than 12 inches long.
 - c. Complete parts box containing motorized shade hardware.
- E. Product Certificates: For each type of roller shade, signed by product manufacturer.
- F. Qualification Data: For Installer.
- G. Product Test Reports: For each type of roller shade.
 - 1. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
 - 2. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.
 - 3. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645
- H. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.
 - 4. Motorized shade operator.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installation of roller shades 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. Source Limitations:
 - 1. Obtain roller shades through one source from a single manufacturer.
 - 2. To control the responsibility for performance of motorized roller shade systems, assign the design, engineering, and installation of motorized roller shade systems, motors, controls, and low voltage electrical control wiring specified in this Section to a single manufacturer and their authorized installer/dealer. The Architect will not produce a set of electrical drawings for the installation of control wiring for the motors, or motor controllers of the motorized roller shades. Power wiring (line voltage), shall be provided by the roller shade installer/dealer, in accordance with the requirements provided by the manufacturer. Coordinate the following with the roller shade installer/dealer:
 - a. Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer's requirements, as indicated on the Electrical Drawings.
 - b. Contractor shall coordinate with requirements of roller shade installer/dealer, before inaccessible areas are constructed.
 - c. Roller shade installer/dealer shall run line voltage as dedicated home runs (of sufficient quantity, in sufficient capacity as required) terminating in junction boxes in locations designated by roller shade dealer.
 - d. Roller shade installer/dealer shall provide and run all line voltage (from the terminating points) to the motor controllers, wire all roller shade motors to the motor controllers, and provide and run low voltage control wiring from motor controllers to switch/ control locations designated by the Architect. All above-ceiling and concealed wiring shall be plenum-rated, or installed in conduit, as required by the electrical code having jurisdiction.
 - e. Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location or schedule.
- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Product Standard: Provide roller shades complying with WCMA A 100.1.
- F. Recycled Content: Provide products with recycled content.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name and location of installation.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Store, handle, protect and install absorptive materials, including fabrics materials, in accordance with the Construction IAQ Management Plan required by Division 1 specifications.

- C. 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 operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY

- A. Motorized Components (exclusive of shade motors and motor logic control systems and components): Twenty-five Years Fit for (intended) use per published terms and conditions, from the Date of Substantial Completion and contain provisions that installation is to remain operational without fault for the warranty period; and, include all operating parts, including shade band.
- B. Shade motors and motor logic control systems: Five years from Date of Substantial Completion for shade motors and motor logic control systems and components. Motorized shade installation will remain operational without fault for the warranty period and include all operational parts.
- C. Installation: Provide roller shade installer's warranty that installation shall be free of defects for a period of not less than 1 year.
- D. In the event of a warranted product failure, the roller shade installer will, at no cost to Owner, facilitate acquisition and delivery of all necessary components to the Owner. Owner will provide roller shade dealer/installer with direct access to the work, during dealer/installer's normal business hours.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Rollers Shades:
 - a. Fabric equal to 5 percent of quantity installed for each color, and shadeband material indicated.
 - b. Brackets equal to 5 percent of quantity installed for each type on Project.
 - 2. Shade Motors: 5 additional.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

- A. Basis-of-Design Products:
 - 1. Roller Shades: Subject to compliance with requirements, provide MechoShade and WhisperShade IQ2+ by MechoShade Systems or equivalent products Draper Flex Shade NEXD or Lutron Rollease.
 - 2. Recycled Content: Provide products with recycled content.
- B. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 - 1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
 - 2. Shade band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades, and less than 2.55 inches for motorize shades are not acceptable.

- b. Provide for positive mechanical engagement with drive / brake mechanism.
 - C. Access and Material Requirements:
 - 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
 - 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
 - D. Shade Brackets: Provide shade hardware constructed of minimum 1/8-inch thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
 - E. Motorized Shade Hardware and Shade Brackets:
 - 1. Provide shade hardware constructed of minimum 1/8-inch thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
 - 2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
 - 3. Basis-of-Design: MechoShade No-Cost Pocket; recessed installation with bottom slot opening.
 - a. Provide exposed extruded aluminum closure mount and removable closure panel to provide access to shades.
 - 4. Pocket Mounting: Provide manufacturers surface mounted pocket with end caps where units are not installed in ceilings or bulkheads.
 - F. Manual Shade Bracket:
 - 1. Basis-of-Design: Mecho 5X.
 - 2. Pocket Mounting: Provide manufacturers surface mounted pocket with end caps where units are not installed in ceilings or bulkheads.
 - G. 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.
 - H. Shade Operation - Motorized operator: Locations indicated.
 - 1. Shades for each area shall function as one group; all shades and all sides raising and lowering simultaneous, as Thermoveil Shadecloth.
 - 2. Shades on same local switch.
 - I. Installation Accessories:
 - 1. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - a. Closure-Panel Width: As required or indicated on Drawings.
 - 2. Installation Accessories Color and Finish: As selected from manufacturer's full range.
- 2.2 ROLLER SHADE FABRICATION
- A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
 - B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate hem as follows:
 - 1. Concealed hem tube (Translucent Shades).
 - C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios

shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

2.3 MANUAL OPERATED CHAIN DRIVE HARDWARE AND BRACKETS

- A. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
- B. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
- C. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
- D. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
- E. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
- F. Drive Bracket / Brake Assembly:
 - 1. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - 2. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- G. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.4 MOTORIZED ROLLER SHADE OPERATORS

- A. Basis-of-Design Product: Specifications and design of shade motors and motor control system are based on the IQ2+ motor logic control system manufactured by MechoShade Systems, Inc. Other systems may be acceptable provide that all of the following performance capabilities are provided. Motor logic control systems not in complete compliance with these performance criteria shall not be accepted as equal systems.
- B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-rewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
 - 1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
 - 2. Motor: Electric Motor Intelligent encoded, tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor, temperature Class A, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor. Max draw for each shade motor shall be 2.3 amps. Low voltage motors do not meet the intent of this specification
 - a. Electrical Characteristics: Single phase, 110 V, 60 Hz
 - b. Motor Noise Rating: Use motors rated as 44 - 46 dbA measured at three feet
 - c. Motor Location: Conceal motors inside shade motor tube

3. Limit Switches: Provide programming of upper and lower stopping points (operating limits) of shadeband's into motors via a hand held removable program module /configurator
4. Wireless Daylight Sensor:
 - a. Location: Clerestory windows in Cafeteria.
 - b. Sensor shall be solar powered photovoltaic requiring no wires or batteries
 - c. Sensor shall operate using EnOcean wireless technology, 902 MHz
 - d. Sensor shall have a temperature range between 32-140 degrees Fahrenheit, a sensitivity of 0-65 klux
 - e. Photosensor shall be daylight spectrum photopic with a field of view as follows: horizontal- 60 degree cone angle, up- 30 degrees and down- 30 degrees
 - f. Provide intermediate stopping positions that allow for 2, 3, 4 or 5 customizable stop positions
 - g. Wireless range shall be 80ft unobstructed
5. Operating Features:
 - a. Group switching with integrated five button, single gang switch control.
 - b. Provide intermediate stopping positions for shades that allow for up to three (3) repeatable and precise aligned positions. All shades on the same switch circuit with the same opening height shall align at each intermediate stopping position
 - c. Provide two modes of operation, uniform and regular. Uniform mode shall allow for shades to only move to intermediate stop positions. Regular mode shall allow for shades to move to both intermediate stop positions, plus any position desired between the upper and lower limits as set by the installer
 - d. Capable of interface with audiovisual control system.
 - e. Switches to be located as shown on drawings
 - 1) All elevations per room controlled by single five button switch
 - 2) Each elevation in rooms to be controlled by five button switching, ten button switch to be used as needed to maximize space requirements

2.5 MOTOR CONTROLS, INTERFACES AND ACCESSORIES

- A. Unless indicated to be excluded, provide required equipment as necessary for a complete operating system providing the control intent specified. Provide components and connections necessary to interface with other systems as indicated.
- B. Low-Voltage Wall Controls; IQ Switch:
 1. Momentary dry contact switch enables manual local control or network control of any individual shade motor or shade group/sub-group.
 2. Control Functions:
 - a. Open: Automatically open controlled shades to fully open position when button is pressed.
 - b. Close: Automatically close controlled shades to fully closed position when button is pressed.
 - c. Presets: For selection of predetermined shade positions.
 - d. Dual Stations: For individual control of two shades/groups.
 3. Single Station: 5-button (open, close, and three intermediate stop positions).

2.6 SHADE CLOTH

- A. Translucent Single-Fabric Shadecloth - Basis-of-Design: MechoShade Systems, Inc., ThermoVeil group.
 1. Shading:
 - a. Basis-of-Design: ThermoVeil 1500 Series, 3 percent open.
 - b. Contractor Option: Fiberglass reinforcement with matching aesthetic and openness; Mermet E Screen is an example of acceptable fabric.

- B. Opaque Light-Blocking Single-Fabric Shadecloth - Kitchen, classroom doors and sidelites, and where indicated:
 - 1. Basis-of-Design: MechoShade Distinctive Blackout 0800 Series.
 - 2. Contractor Option: Matching aesthetic and fabric type; Mermet Flocke is an example of acceptable fabric.
- C. Colors: Selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
- 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. Allow clearances for window operation hardware.
- B. Connections: Connect motorized operators to building electrical system.

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 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades.

END OF SECTION

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SECTION 12 35 53 - WOOD LABORATORY CASEWORK

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wood laboratory casework.
 - 2. Laboratory countertops.
 - 3. Shelves.
 - 4. Accessories.
- B. Wood laboratory casework and equipment as specified herein and as scheduled, and noted on the drawings is to be furnished, delivered, and installed in the location required by the drawings, and left ready for connection of plumbing fixtures and electrical fixtures by others.
- C. Casework and related work shall include:
 - 1. Furnishing, delivering to the building, uncrating, setting in place and leveling all casework and equipment listed in this specification or equipment schedule and/or shown on the drawings.
 - 2. Furnishing and installing countertops as shown on the drawings, of the size and shape required on all laboratory casework.
 - 3. Remove all debris, dirt and rubbish accumulated as a result of installation of this equipment, leaving premises broom clean and orderly.
 - 4. Final Adjustment: It is recognized that wood doors and drawers will swell and stick because of unusually high ambient moisture in new construction work. Casework installer shall during the first year return after final inspection to make any final adjustments to drawers and doors to eliminate sticking or other problems. Any doors or drawers, which cannot be corrected shall be replaced.

1.2 DEFINITIONS

- A. Exposed Portions of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.
 - 1. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets after installation shall not be considered exposed.
- B. Semiexposed Portions of Casework: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semiexposed.
- C. Concealed portions of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include independent certification that applied finish complies with specified chemical and physical resistance requirements.
- B. Shop Drawings: For wood laboratory casework. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate locations of blocking and reinforcements required for installing laboratory casework.
 - 2. Include details of exposed conduits, if required, for service fittings.

3. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
 4. Include coordinated dimensions for laboratory equipment and service fittings specified in other Sections.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework finishes and countertops with requirements specified for chemical and physical resistance.
- D. Maintenance Data: For laboratory casework to include in maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain laboratory casework, including countertops, sinks, service fittings, and accessories, through one source from a single manufacturer.
- B. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Unless modified by notation on Drawings, or otherwise specified, catalog description for designated product constitutes requirements for each product and establishes a standard of design and quality for materials, construction and workmanship. Other acceptable manufacturers' laboratory casework of similar sizes, similar door and drawer configurations, and complying with the Specifications will be accepted.
- C. Product Standard: Comply with SEFA 8, "Laboratory Furniture--Casework, Shelving and Tables--Recommended Practices."
- D. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements of NFPA 30 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Accessibility Requirements: In addition to local governing regulations, comply with "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver laboratory casework only after wet operations in areas where casework is to be installed are completed.
- B. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.
- C. Store completed laboratory casework in a ventilated place, protected from the weather, with relative humidity of 50 percent or less at 70 deg F.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install wood laboratory casework until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of wood laboratory casework.
- B. Coordinate installation of wood laboratory casework with installation of fume hoods and other laboratory equipment.

1.8 WARRANTY

- A. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of laboratory casework systems due to defects of material and workmanship. Warranty shall not cover damage caused by misuse or negligence.

1. Warranty Period: 3 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Wood Laboratory Casework:
 - a. ICI Campbell Rhea.
 - b. Kewaunee Scientific Corporation, Laboratory Products Group.
 - c. CiF.
 - d. Leonard Peterson & Company.
 - e. Sheldon.
 2. Countertops: Refer to section 12 36 61.16 – Solid Surfacing Countertops.

2.2 CABINET MATERIALS

- A. General:
 1. Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body.
 - a. All non-FSC wood in assemblies with FSC-certified wood: Comply with FSC Controlled Wood (CW) criteria.
 2. Recycled Content: Provide particleboard and MDF with minimum 80 percent recycled content.
 3. Composite wood: Comply with low-emitting requirements of CARB, NAF.
 4. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
 5. Hardwood Plywood: HPVA HP-1 made with adhesive containing no urea formaldehyde, either veneer core or particle core, unless otherwise indicated.
 6. Edgbanding for Wood-Veneered Construction: Minimum 1/8-inch-thick, solid wood of same species as face veneer; laminating glue shall contain no urea-formaldehyde.
- B. Exposed Materials:
 1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
 2. Wood Species and Veneer Cut: White Oak; rift cut.
 3. Stain Colors and Finishes: Match flush wood doors.
 4. Solid Wood: Clear hardwood lumber.
 5. Plywood: Urea-formaldehyde free hardwood plywood; Grade A exposed faces at least 1/50 inch thick, Grade J crossbands, and backs of same species as faces.
- C. Semiexposed Materials:
 1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of any species similar in color and grain to exposed solid wood.

2. Plywood: Urea-formaldehyde free hardwood plywood of any species similar in color and grain to exposed plywood. Grade B faces, Grade J crossbands, and backs of same species as faces. Semiexposed backs of plywood with exposed faces shall be same species as faces.

D. Concealed Materials:

1. Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.
2. Plywood: Urea-formaldehyde free hardwood plywood. Concealed backs of plywood with exposed or semiexposed faces shall be same species as faces.
3. Particleboard: ANSI A208.1, Grade M-3 Exterior Glue complying with requirements in ANSI A208.1, Grade M-3.
4. Hardboard: AHA A135.4, Class 1 tempered.

- E. Glass for Glazed Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; not less than 5.5 mm thick.

2.3 CABINET DESIGN

- A. As indicated by scheduled product listed on the Drawings.
- B. Grain Direction: Vertical on doors, horizontal on drawer fronts.

2.4 CABINET FABRICATION

- A. Construction: Provide wood-faced laboratory casework of the following minimum construction:
 1. Bottoms and Ends of Cabinets, Shelves, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch- thick plywood.
 2. Base Cabinet Top Frames: 3/4-by-2-inch solid wood with mortise and tenon or doweled connections, glued with urea-formaldehyde free glue and pinned or screwed.
 3. Backs of Cabinets: 3/4-inch- thick plywood where exposed, 1/4-inch- thick hardboard dadoed into sides, bottoms, and tops where not exposed.
 4. Drawer Fronts: 3/4-inch- thick plywood or solid hardwood.
 5. Drawer Sides and Backs: 1/2-inch- thick solid wood or plywood, with urea-formaldehyde free glued dovetail or multiple-dowel joints.
 6. Drawer Bottoms: 1/4-inch- thick plywood glued and dadoed into front, back, and sides of drawers. Use 1/2-inch- thick material for drawers more than 24 inches wide.
 7. Doors 48 Inches or Less in Height: 3/4 inch thick, with particleboard or medium-density fiberboard cores, solid hardwood stiles and rails, and hardwood face veneers and crossbands.
 8. Doors More Than 48 Inches in Height: 1-1/8 inches thick, with honeycomb cores, solid hardwood stiles and rails, and veneer plywood on both sides.
 9. Stiles and Rails of Glazed Doors: 3/4-inch- thick solid hardwood.
- B. Leg Shoes: Vinyl or rubber, black, open-bottom type.
 1. Provide minimum 1-1/2-inch-diameter, nonmarring floor glides with minimum 5/8-inch height adjustment capability, for open-leg tables.
- C. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinet fronts.
- D. Accessibility Requirements: Modify cabinets where indicated, as required to comply with the "Americans with Disabilities Act (ADA)."

2.5 WOOD FINISH

- A. Preparation: Sand lumber and plywood for laboratory casework construction before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand casework after assembling for uniform smoothness at least equivalent to that produced by 220 grit sanding and without machine marks, cross sanding, or other surface blemishes.
- B. Staining: Remove fibers and dust and apply stain to exposed and semiexposed surfaces as necessary to match approved Samples. Apply stain in a manner that will produce a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.
- C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard three-coat, chemical-resistant, transparent finish consisting of sealer and catalyzed topcoat(s). Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.
 - 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2.6 CABINET HARDWARE

- A. General: Provide laboratory casework manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges: Stainless-steel, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 48 inches or less in height; 3 for doors more than 48 inches in height.
- C. Pulls: Solid aluminum, stainless steel, or satin-plated brass; fastened from back with two screws. For sliding doors, provide stainless-steel or chrome-plated recessed flush pulls. Provide 2 pulls for drawers more than 24 inches in width.
- D. Catches:
 - 1. LH-340 steel magnetic catch for base and wall cabinets. Minimum 6 lb. pull.
 - 2. LHI-341 steel magnetic catch for tall cabinets. Two per door. Minimum 14 lb. pull per catch.
- E. Drawer Slides: Powder-coated, full-extension, self-closing, heavy-duty drawer slides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05091, and rated for 150 lbf. Basis-of-Design: Grant #345 or equal by Blum (no center guides).
- F. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches, attached with screws or rivets. Provide on all drawers.
- G. Locks: Cam type with 5-pin tumbler, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281.
 - 1. Provide minimum of two keys per lock and two master keys.
 - 2. Provide on all drawers and doors.
- H. Adjustable shelf clips; shall be LH-354 heavy duty shelf support clips with positive locking pin for back two supports on adjustable shelves. Molded of natural nylon. Alternative method of adjustable shelf locking is to rout out bottom of shelf to exact shape and depth of each shelf support so that shelf fits down over supports.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of wood laboratory casework.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

- A. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Base Cabinets: Adjust top rails and subtops within 1/16 inch of a single plane. Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Fasten adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
 - 1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than 2 fasteners per side.
- C. Wall Cabinets: Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c. Align similar adjoining doors to a tolerance of 1/16 inch.
- D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- E. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

- A. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
- B. Field Jointing: Where possible, make in the same manner as shop jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop.
 - 1. Use concealed clamping devices for field joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.
- C. Fastening:
 - 1. Secure countertops to cabinets with construction adhesive, applied at each corner and along perimeter edges at not more than 48 inches o.c.
 - 2. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
- D. Provide required holes and cutouts for service fittings.
- E. Provide scribe moldings for closures at junctures of countertop, curb, and splash, with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
- F. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF ACCESSORIES

- A. Install accessories according to Shop Drawings and manufacturer's written instructions.
- B. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

3.5 CLEANING AND PROTECTING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

- B. Protect countertop surfaces during construction with 6-mil plastic or other suitable water-resistant covering. Tape to underside of countertop at minimum of 48 inches o.c.

END OF SECTION 12 35 53

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SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes the following solid surface materials that are the Basis-of-Design for project countertops:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.
 - 3. Solid surface material end splashes.
 - 4. Solid surface material apron fronts.

1.2 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.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical countertop as indicated on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.
 - 1. Basis-of-Design: Formica.
 - 2. Type: Provide Standard type unless Special Purpose type is indicated.
 - 3. Colors and Patterns: Basis-of-Design: Luna Sand #757 by Formica.
- B. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 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: Custom.
- B. Configuration:
 - 1. Front: Straight, slightly eased at top.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. End Splash: Matching backsplash.
- C. Countertops:
 - 1. 3/4-inch- thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 3/4-inch- thick, solid surface material.
- E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
- F. Joints:
 - 1. Fabricate countertops in sections for joining in field.
 - a. 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.
 - b. 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.
- G. 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.
 - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
 - 4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 ACCESSORIES

- A. Pop-Up Receptacles: Basis-of-Design, Dough Mockett Model PCS103A/EE.
 - 1. Coordinate with electrical for locations.
 - 2. Color: As selected by the Architect from manufacturer's full range.
- B. Surface and recessed mounted "Rakks" Counter Brackets: L-shaped bracket fabricated from aluminum T sections; Model No. EH-1818 and EH-1824 as manufactured by Rangine Corporation.
 - 1. Load capacity per bracket: 450 pounds.
 - 2. Finish: Primed for field painting.
 - 3. Provide with 5/8 inch opening rubber grommet installed in 7/8 inch hole.
 - 4. Other Acceptable Products:
 - a. Federal Brace; engineered steel bracket of matching design.
 - b. Custom fabrication engineered of matching design in steel or aluminum, with architectural finished welding.

2.4 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- F. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.

- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- H. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.16

SECTION 12 36 61.19 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertops.
2. Quartz agglomerate backsplashes.
3. Quartz agglomerate end splashes.
4. Quartz agglomerate apron fronts.

B. Related Requirements:

1. Refer to Section 12 36 40 Stone Countertops as an acceptable alternate to this section.
2. Refer to Section 12 36 61.16 Solid Surfacing Countertops as an acceptable alternate to this section.

1.2 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.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as indicated on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of polymers, resins, and pigment and complying with ISFA 3-01.
 - 1. Basis-of-Design: Silestone.
 - 2. Colors and Patterns: As selected by Architect from manufacturer's full range up to group 3.
- B. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 FABRICATION

- A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:
 - 1. Front: Straight, slightly eased at top.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. End Splash: Matching backsplash.
- C. Countertops: 3/4-inch- thick, quartz agglomerate with front edge built up with same material.
- D. Backsplashes: 3/4-inch- thick, quartz agglomerate.
- E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
- F. Joints:
 - 1. Fabricate countertops in sections for joining in field.
 - a. 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.
 - b. Joint Type, Sealant Filled: 1/16 inch in width.
 - c. 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.
- G. 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.
 - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 ACCESSORIES

- A. Pop-Up Receptacles: Basis-of-Design, Dough Mockett Model PCS103A/EE.
 1. Coordinate with electrical for locations.
 2. Color: As selected by the Architect from manufacturer's full range.
- B. Surface and recessed mounted "Rakks" Counter Brackets: L-shaped bracket fabricated from aluminum T sections; Model No. EH-1818 and EH-1824 as manufactured by Rangine Corporation.
 1. Load capacity per bracket: 450 pounds.
 2. Finish: Primed for field painting.
 3. Provide with 5/8 inch opening rubber grommet installed in 7/8 inch hole.
 4. Other Acceptable Products:
 - a. Federal Brace; engineered steel bracket of matching design.
 - b. Custom fabrication engineered of matching design in steel or aluminum, with architectural finished welding.

2.4 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.19

SECTION 14 21 00 ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Electric Traction Elevators.
- B. Contractor to provide the following:
 - 1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
 - 2. Hoistway ventilation shall be in accordance with local and national building code requirements.
 - 3. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
 - 4. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
 - 5. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
 - 6. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
 - 7. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
- C. Industry and government standards:
 - 1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
 - 2. ADAAG - Accessibility Guidelines for Buildings and Facilities
 - 3. ANSI/NFPA 70, National Electrical Code
 - 4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
 - 5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.2 DESCRIPTION OF ELEVATOR

- A. Basis-of-Design Elevator Equipment: MonoSpace® 300 gearless traction elevator
- B. Drive: Non Regenerative
- C. Quantity of Elevators: 1 Elevator
- D. Landings: 2
- E. Openings: 2 Front Openings
- F. Travel: As indicated on the drawings.
- G. Rated Capacity: 2,500 lb
- H. Rated Speed: 150 FPM
- I. Cab Height: 8'-0"
- J. Clear height under suspended ceiling: 7'-6"
- K. Entrance Width and Type: 42" and Left Opening Diagonal
- L. Entrance Height: 7'-0"
- M. Main Power Supply: 208 V Volts + 5%, three-phase
- N. Operation: Simplex
- O. Machine Location: Inside the hoistway mounted on car guide rail

- P. Control Space Location: Remote closet
- Q. Elevator Equipment shall conform to the requirements of seismic zone: Non-Seismic
- R. Maintenance Service Period: 12 Months

1.3 PERFORMANCE REQUIREMENTS

- A. Car Performance
 - 1. Car Speed \pm 5% of contract speed under any loading condition or direction of travel.
 - 2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.
- B. System Performance
 - 1. Vertical Vibration (maximum): 15 mg ISO187338/ISO 8041 system pk – pk
 - 2. Horizontal Vibration (maximum): 12 mg ISO187338/ISO 8041 system pk – pk
 - 3. Jerk Rate (maximum): 3.3 ft/sec³
 - 4. Acceleration (maximum): 1.3 ft/sec²
 - 5. In Car Noise: 55 dB(A) Maximum
 - 6. Leveling Accuracy: \pm 0.2 inches
 - 7. Starts per hour (maximum): 240

1.4 SUBMITTALS

- A. Comply with Section 01 3000 - Administrative Procedures.
- B. Product Data: Submit manufacturer's product literature for each proposed system.
 - 1. Cab design, dimensions and layout.
 - 2. Layout, finishes, and accessories and available options.
 - 3. Controls, signals and operating system.
 - 4. Color selection charts for cab and entrances.
- C. Shop Drawings:
 - 1. Provide project specific shop drawings indicating the following items:
 - a. Clearances and travel of car.
 - b. Clear inside hoistway and pit dimensions.
 - c. Location and layout of equipment and signals.
 - d. Car, guide rails, buffers and other components in hoistway.
 - e. Maximum rail bracket spacing.
 - f. Maximum loads imposed on building structure.
 - g. Hoist beam requirements.
 - h. Location and sizes of access doors.
 - i. Location and details of hoistway door and frames.
 - j. Electrical characteristics and connection requirements.
- D. Operation and maintenance data:
 - 1. Provide manufacturer's standard maintenance and operation manual.
- E. Diagnostic Tools
 - 1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed.
 - 2. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor.

3. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner.
4. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor.
5. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Minimum of fifteen years' experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.
- B. Installer: The equipment manufacturer shall install the elevator.
- C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.

1.6 DELIVERY, STORAGE AND HANDLING

- A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises. Additional labor costs for double handling will be the responsibility of the general contractor.
- B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.7 WARRANTY

- A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.8 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 months after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.
- B. Maintenance service to be performed during regular working hours of regular working days and shall include emergency call back service during regular working hours.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification.

2.2 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microcomputer based control system to perform all of the functions.
 - 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where 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 and physically segregated from the rest of the controller.
 - 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 - 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- C. Controller Location: Locate controller in the front wall integrated with the top landing entrance frame, machine side of the elevator. One non-fused three phase permanent power in hoist way at top landing. A separate control space should not be required.

2.3 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.
- B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- C. Buffers, Car and Counterweight: Brushed Stainless Steel.
- D. Hoistway Operating Devices:
 - 1. Emergency stop switch in the pit
 - 2. Terminal stopping switches.
 - 3. Emergency stop switch on the machine
- E. Positioning System: System consisting of magnets and proximity switches.
- F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.4 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Entrances
 - 1. Sills: Aluminum extruded.
 - 2. Doors: Hollow metal construction with vertical internal channel reinforcements.
 - 3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
 - 4. Entrance Finish: Brushed Stainless Steel.
 - 5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.5 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
- B. Platform: Platform shall be all steel construction.
- C. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- D. Steel Cab
- E. Car Wall Finish:

1. Side and Rear Walls: Raised removable vertical plastic laminate panels, selected from manufacturers full range.
 2. Front Wall: #4 Brushed Stainless Steel (441)
 - F. Cab Wall Protection Pads to be included with hooks
 - G. Car Skirting Finish: Brushed Stainless Steel
 - H. Car Front Finish: Brushed Stainless Steel
 - I. Car Door Finish: Brushed Stainless Steel
 - J. Ceiling: #4 Brushed Stainless Steel with Round LED spotlights (CL88)
 - K. Handrail: Brushed Stainless Steel
 1. Rails to be located on Side Walls of car enclosure.
 - L. Sills: Aluminum extruded.
 - M. Flooring: By others. (Not to exceed 6lb/sqft and 1/2" finished depth.)
 - N. Emergency Car Signals
 1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
 2. Emergency Car Lighting: Provide emergency power unit employing a 12- volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
 - O. Ventilation: Fan
- 2.6 EQUIPMENT: SIGNAL DEVICES AND FIXTURES
- A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation. Fixture finish to be: Brushed Stainless Steel
 1. Auxiliary Flush mounted car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have White Dot Matrix illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be White DOT-matrix. All texts, when illuminated, shall be White. The car operating panel shall have a Brushed Stainless Steel finish.
 2. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel (Brushed Stainless Steel)
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help buttons with raised markings.
 - d. In car stop switch per local code.
 - e. Call Cancel Button.
 - B. Hall Fixtures: Wall mounted hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a Brushed Stainless Steel finish.
 1. Hall fixtures shall feature round, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be in a vertically mounted fixture.
 - C. 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. The chime will sound once for up and twice for down. The car riding lantern face plate shall have a Brushed Stainless Steel finish.

2.7 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation

1. 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.
2. Zoned Car Parking.
3. Relative System Response Dispatching.

B. Standard Operating Features to include:

1. Full Collective Operation
2. Fan and Light Control.
3. Load Weighing Bypass.
4. Ascending Car Uncontrolled Movement Protection
5. Top of Car Inspection Station.

C. Additional Operating Features to include:

1. Independent Service.
2. Hoistway Access Bottom Landing.
3. Hoistway Access Top Landing.
4. Car Wall Protection Pads
5. Intercom Provisions
6. Emergency Battery Power Supply

- a. When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. The elevator will rise or lower to the first available landing, open the doors, and shut down. The elevator will return to service upon the return of normal main line power. An auxiliary contact on the main line disconnect and shunt trip breaker (if used) will be provided by others.

D. Elevator Control System for Inspections and Emergency

1. Provide devices within controller to run the elevator in inspection operation.
2. Provide devices on car top to run the elevator in inspection operation.
3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
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.
7. Provide the means for the control to reset elevator earthquake operation.

2.8 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.
- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of

a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.

- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.
- B. Do not proceed with work until unsatisfactory conditions are corrected.
- C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.
- D. Prior to start of Work, verify projections greater than 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
- E. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
- G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.
- H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.2 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.3 INSTALLATION

- A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.
- C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.
- D. Lubricate operating system components in accordance with manufacturer recommendations.
- E. Perform final adjustments, and necessary service prior to substantial completion.

3.4 CONSTRUCTION

A. Interface with Other Work:

1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
 - a. Ensure adequate support for entrance attachment points at all landings.
 - b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
 - c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
 - d. Coordinate interface of elevators and fire alarm system.
 - e. Coordinate interface of dedicated telephone line.

3.5 TESTING AND INSPECTIONS

- A. Perform recommended and required testing in accordance with authority having jurisdiction.
- B. Obtain required permits and provide originals to Owner's Representative.

3.6 DEMONSTRATION

- A. Prior to substantial completion, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

END OF SECTION

SECTION 21 10 00 - FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 23 01 00 "Mechanical General Provisions" apply to this Section.

1.2 SCOPE

- A. The work includes the designing and providing of approved automatic wet-pipe sprinkler system for light and ordinary occupancies for complete coverage of the entire building.
- B. Contractor shall make connection to fire service main at a point 5'-0" outside of building unless otherwise noted on drawings.
- C. All work shall conform to applicable portions of the latest edition of NFPA 13. Electrical work required by this Specification Section shall be accomplished in conformance with the requirements of the applicable Division 26 Specification Sections.
- D. All piping shall be concealed above ceilings. In areas with exposed construction, install piping as high as possible. Piping to valve cabinets shall be concealed in walls.

1.3 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

- A. Select equipment and materials from "List of Inspected Fire Protection Equipment and Materials" published annually by UL. Equipment shall bear UL approval stamp or label.

1.4 SUBMITTALS AND SHOP DRAWINGS

- A. Before any work is commenced, the Contractor shall submit a Revit model of the complete sprinkler system. The model submitted shall correctly and accurately depict the purposed layout of the sprinkler mains, branches, heads and all miscellaneous accessories. In addition, the Contractor shall submit a complete set of working drawings of the system, a partial submittal will not be reviewed. The submittal shall include the full descriptive data for riser check valves or riser manifold assemblies, gate valves, check valves, alarms, sprinkler heads, hangers, fire department connections and all other devices; materials and equipment as one complete package. Shop drawing resubmittals shall be returned as one complete package.
- B. Submit drawings, hydraulic calculations and flow test data having them approved by agency having jurisdiction before installation; obtain certificate of inspection and approval from same agency. Contractor shall obtain from the Architect the Revit models for the building and coordinate routings within the model. This shall include architectural, structural, mechanical, plumbing, and electrical models. Coordination drawings prepared in Revit and in the building, model shall be submitted as part of the shop drawing submittal.

1.5 WATER SOURCE FLOW TEST

- A. The Contractor shall obtain a flow test at the point at which the sprinkler system connects to the water source. The responsibility of obtaining the flow test and any costs associated with obtaining the flow test shall be borne by the Contractor. A copy of the test data shall be submitted along with the drawings and hydraulic calculations. Any flow test data given in the Contract documents is for the basis of obtaining a bid only and shall not be used by the Contractor for design purposes.

- B. Flow Data shall not be older than 12 months and a repeat testing shall be performed subsequent to any water infrastructure improvements, repairs or adjustments to the site water source.
- C. The Contractor shall be responsible for designing the sprinkler system to meet any and all pressure adjustments that the local authority having jurisdiction requires. These adjustments may be due to seasonal fluctuations in water pressure depending on the time of year that the flow tests are taken. Adjustments may also be required due to forecasts of future demands on the water source. The contractor shall obtain direction from the local authority at the time of requesting a water source flow test for all required adjustments and prior to performing hydraulic calculations and system design.

1.6 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that the work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from Substantial Completion.
- B. Contractor shall service the systems for 12 months from date of Substantial Completion. Such service shall include all emergency services and adjustments.

PART 2 - PRODUCTS

2.1 SPRINKLER HEADS

- A. Sprinkler heads shall be automatic, closed, conventional type of ordinary degree temperature rating, except in locations near heaters where they shall be of high-temperature rating as required by NFPA 13.
- B. Furnish a supply of six (6) extra sprinklers and one (1) special sprinkler wrench. Supply shall include all types and ratings installed.
- C. Provide where directed one approved metal cabinet with hinged door for storing extra sprinklers and wrench.
- D. Provide upright sprinklers in areas without ceilings with standard brass finish.
- E. Provide recessed pendent sprinklers in areas with ceilings with bright chrome finish and chrome escutcheon plate.
- F. Provide UL Listed sprinkler guards on sprinklers which are exposed and subject to physical damage. This shall include, but not be limited to, storage rooms, mechanical rooms, electrical rooms and similar spaces.
- G. Extended coverage sprinkler heads may be used where allowed by Code.
- H. Sprinkler heads shall be STAR, VIKING, VICTAULIC, or approved equal.

2.2 ALARMS

- A. Provide water-actuated flow and electrically-actuated tamper switch alarms. Flow and tamper switch alarms shall be compatible with building fire alarm systems specified under Division 28. Alarm bell shall be provided by division 28.
- B. Provide flow switches at each sprinkler riser.
- C. Provide tamper switches at each riser valve and backflow preventer valve.
- D. Coordinate with the type of fire alarm system to be provided (see Specification Section 28 31 11) and provide all material and labor necessary for the monitoring of the flow switches and tamper switches by the building fire alarm control panel. Final connections at the fire alarm control panel shall be accomplished under Division 28.

2.3 FLEXIBLE SPRINKLER HOSE FITTINGS (IF REQUIRED)

- A. As an option to rigid pipe connections in areas with acoustical tile ceilings and grids, flexible sprinkler hose fittings as manufactured by VIC FLEX, FLEXHEAD, or approved equal may be used.
- B. Hose fittings must be in accordance with NFPA 13 and must be FM Approved for its intended use pursuant to FM 1637 Approval Standard for Flexible Sprinkler Hose with Threaded End Fittings. Hose fittings must also be UL Listed for its intended use pursuant to UL 2443 Standard for Flexible Sprinkler Hose with Fittings for Fire Protection Service.
- C. Hose fittings shall be constructed of type 304 stainless steel.
- D. Drop system with union joints shall be factory pressure tested to 400 PSI.
- E. Hose fittings shall be leak tested, and must be listed for a minimum of (3) 90-degree bends.
- F. Hose fitting ceiling bracket shall be one-piece open gate.
- G. Hose fittings shall be direct attachment type, having integrated snap-on clip ends positively attached to the ceiling using tamper resistant screws.
- H. Flexible hose shall have minimum bend radius of 7" for FM and 3" for UL.

2.4 PIPE AND FITTINGS

- A. Provide piping above ground in accordance with NFPA 13, subject to the following:
 - 1. Non-metallic pipe shall not be allowed.
 - 2. The minimum wall thickness for steel pipe 2" and larger joined by welding or by roll-grooved pipe and fittings shall be in accordance with Schedule 10 pipe for pressures up to 300 psi. Threaded pipe and fittings 1-1/2" and smaller shall be Schedule 40.
- B. All underground piping and In-Building Riser shall be outside coated, ductile iron with mechanical joint utilizing ductile-iron retainer gland or ductile-iron flanges or shall be composed of a single extended 90-degree fitting of fabricated 304 stainless-steel tubing, maximum working pressure of 175 psi. The fittings shall have a grooved-end connection on the outlet (building) side and a cast-iron pipe size (CIPS) coupler on the underground (inlet) side.
- C. Fittings for ductile-iron pipe shall be of same class and coating as pipe.
- D. Joints for above ground pipe shall be threaded, flanged, or grooved VICTAULIC Firelock 005 or 009 couplings and fittings for rigid joint, or approved equal.
- E. Gaskets - VICTAULIC couplings shall be supplied with Grade E/Type A gaskets for wet sprinkler service and Flushseal for dry service.
- F. All grooved components (couplings, fittings, etc.) shall be of one manufacturer - Basis of Design – VICTAULIC COMPANY OF AMERICA.
- G. Couplings shall be installed per manufacturer's instructions. If a torque wrench is required, it shall be used.

2.5 VALVES

- A. Gate valves shall be iron body bronze mounted, solid wedge gate, rising stem, OS & Y for 175 psi CWP. JENKINS BROTHERS, Figure 824CJ. Valves shall be UL approved.
- B. Butterfly valves may be used in lieu of gate valves. Valves shall have ductile-iron body with nickel-plated ductile-iron disc, 416SS stem, Buna-N seat, suitable for 250 psi dead-end shut off and gear operator with position indicator. Valves shall be UL approved, VICTAULIC 705.

2.6 SUPPORTS, HANGERS AND INSERTS

- A. Support piping from building structure by means of hangers, inserts and other supports as per requirements of NFPA 13, Chapter 9. In addition to these requirements, hangers, including rods and clamps, shall be hot dipped galvanized exterior to the building and in all mechanical spaces, zinc plated in all interior spaces, except as otherwise specified.

2.7 PIPE SLEEVES AND ESCUTCHEONS

- A. Provide sleeves to accommodate pipes passing through foundations, walls, floors and partitions. Sleeves shall be grouted in place in masonry walls and concrete floors. Refer to Section 23 01 00 for additional requirements. Provide escutcheons at exposed finished surfaces pierced by pipes.

2.8 VALVE SEALS, SIGNS AND TAGS

- A. Seals: Provide UL-approved seals for all control valves sealed in open position.
- B. Signs: Provide identification signs of standard design; fasten securely at designated locations per NFPA.
- C. Tags: Provide brass tags 2" in diameter, stamp with designating numbers and secure with 12-gauge wire to spindle of control valves.

2.9 BACKFLOW PREVENTER

- A. Backflow preventer shall be reduced pressure type with Butterfly valves and tamper switches. Backflow preventer shall be UL-, FM-approved. WILKINS 475V-BF, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location and sizes of mains, risers, branches, valves and numbers of sprinkler heads shall be as required by codes, regulations and as approved.
- B. System shall be designed and installed to give full consideration to built-in and concealed spaces, piping, electrical equipment, ducts and all other construction and equipment to afford complete coverage and be free from operating and maintenance difficulties.
- C. Place sprinkler heads upward with deflectors parallel to roof except in areas with ceilings.
- D. Sprinkler head locations in areas with ceilings shall be coordinated with the Architect's reflected ceiling plans or shall be located as directed by Architect.
- E. In areas with lay-in acoustic tile ceilings, sprinkler heads shall be located in the center of the ceiling tiles, unless otherwise indicated.
- F. Install horizontal piping graded to low points and in manner to make possible to test and drain entire system. Test and drain locations shall be coordinated with the architect.

3.2 TEST

- A. Subject system to test required by and in presence of representative of agencies having jurisdiction. Details of test not covered by agencies' requirements shall be in accordance with NFPA 13.
- B. Conduct test required in presence of agencies having jurisdiction and in accordance with their instructions.
- C. Provide instruments, equipment and pay expenses incurred in making test.

END OF SECTION 21 10 00

SECTION 22 05 00 - PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 23 01 00 "Mechanical General Provisions" apply to this Section.

1.2 SERVICE CONNECTIONS

- A. Contractor shall make all connections of building sewer to main and rain leaders to storm drain and domestic water to water service, at a point 5'-0" outside of building, unless otherwise noted on drawings.

1.3 PERMITS

- A. Contractor shall give all required notices and secure all necessary permits. Inspection certificates from local authorities having jurisdiction shall be delivered to the Architect prior to final payment.

1.4 GENERAL REQUIREMENTS

- A. Follow Plumbing Code for minimum requirements; where drawings or specifications are at variance with Code, follow whichever provides for maximum size or condition.
- B. Verify all grades, elevations and utility connections before commencing work.
- C. Comply with requirements of the Uniform Federal Accessibility Standards (UFAS).
- D. All pipe, fittings and fixtures that are connected to potable water systems must meet the current Water Drinking Act and where applicable, meet NSF Standard 61 and be so labeled and be so certified. All plumbing valves, devices, fixtures and fittings shall be lead free.

1.5 SUBMITTALS AND SHOP DRAWINGS

- A. Submit manufacturer's data on the following:
 - Plumbing Fixtures
 - Plumbing Fixture Supports
 - Faucets
 - Flush Valves
 - Balancing Valves
 - Elevator Sump Pump
 - Supplies and Traps
 - Floor Drains
 - Cleanouts
 - Water Hammer Arrestors
 - Valves
 - Backflow Prevention Devices
 - Mixing Valves
 - Waterless (Barrier Type) Trap Seal
- B. Submit shop drawings on the following:
 - Elevator Sump Pump
- C. Submit a schedule of all pipe materials to be used for each type of service.

1.6 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from date of Substantial Completion.
- B. During the guarantee period, the Contractor shall repair or replace defective material and workmanship and place same in working order to the satisfaction of the Architect at no additional expense to the Owner.
- C. Contractor shall service the systems for 12 months from date of Substantial Completion. Such service shall include all emergency services and adjustments, except cleaning of filters and screens.

PART 2 - PRODUCTS

2.1 SOIL, WASTE, DRAIN AND VENT PIPING

- A. Underground soil, waste, drain, and vent piping within the building and to a point 5'-0" outside of building foundation shall be centrifugally cast, coated Service Weight hub-and-spigot (ASTM A74), hubless cast-iron (ASTM A888), or DWV Schedule 40 PVC pipe (ASTM D2665) and fittings, unless otherwise noted.
- B. Above ground soil, waste, drain, and vent piping shall be hubless cast-iron pipe (ASTM A888), or DWV Schedule 40 PVC pipe (ASTM D2665) and fittings, except that PVC pipe shall not be used where piping penetrates fire partitions, or any location not allowed by the Building Code. PVC piping for any service shall not be installed in return air plenums. Use materials acceptable to be used in return air plenums.
- C. Foam Core PVC piping is not acceptable for any application.
- D. Hub-and-spigot piping shall be assembled using plain-end spigot and positive double-seal elastomeric compression-type gasket joints above ground. Hubless pipe and fittings shall be assembled using Neoprene gasket and stainless-steel retaining sleeve. Underground hubless pipe and fittings shall be assembled per paragraph below. PVC pipe and fittings shall be assembled in strict accordance with manufacturer's instructions. Solvent cement shall conform to ASTM D2564.
- E. Hubless Cast-iron Pipe and Fittings - Below Grade: Joints shall be heavy duty, Factory Mutual approved, to FM 1680 Class 1, type 304 stainless-steel couplings with a shield thickness of .024 (24 gauge) with 125 in/lb. worm drive clamps with Neoprene gaskets conforming to ASTM C564. Couplings 1-1/2" to 4" in diameter shall be 3" wide and have two clamps. Couplings 5" to 10" in diameter shall be 4" wide and have four clamps. Couplings 12" and 15" wide shall be 5-5/8" wide and have six clamps. Model HI-TORQ 125 as manufactured by CLAMP-ALL PRODUCTS, IDEAL CLAMP PRODUCTS, or approved equal.

2.2 CLEANING PLUGS AND TEST TEES

- A. Provide cleanouts as indicated and/or required by the Plumbing Code.
- B. Cleanouts shall be the same size as pipe, up to 4". Cleanouts for pipes larger than 4" shall be sized in accordance with the Plumbing Code. Cleanouts installed in connection with cast-iron, hub-and-spigot pipe shall consist of longsweep 1/4 bends or one or two 1/8 bends extended to easily accessible, approved location or where indicated. Extra-heavy cast-brass ferrule with cast-brass cleanout plug shall be caulked into hub of fittings and shall be flush with floor. Cleanouts in connection with threaded pipe shall be cast-iron drainage T-pattern 90-degree branch fittings with extra-heavy brass screw plugs of the same size as pipes, up to and including 4". Install test tees with cast-iron cleanout plugs at foot of soil, waste and drain stacks and on each building drain outside building. Where cleanouts occur on pipe concealed in partitions and walls, provide with chromium-plated cast-brass plate secured to brass plugs.

Verify cleanout locations before pipe installation. Extend cleanout plugs to within 1" of finished wall.

- C. See paragraph FIXTURES AND EQUIPMENT for cleanout access covers.
- D. Cleanouts indicated outside of building shall be flush with grade and have concrete pad as specified in Section 23 01 00.

2.3 TRAPS

- A. Provide a trap for each fixture and piece of equipment requiring connections to drainage system. Supply traps with fixtures. Place each trap as near fixture as possible and no fixture shall be double trapped. Traps installed on threaded pipe shall be recess drainage pattern. Trap on all floor drains shall be deep-seal type.
- B. Provide waterless (Barrier-type) trap seal devices on floor drains as indicated on plans. Trap seals by GREEN DRAIN, PROSET or approved equal.
- C. Exposed traps and drain piping shall be chromium plated.

2.4 WATER PIPING

- A. Water piping shall be copper tubing, Type K, hard-tempered underground and Type L, hard-tempered above ground. Piping shall be assembled with wrought-copper fittings using 95-5 solder above ground and silver solder underground.
- B. Press Connector Fittings:
 - 1. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and NSF/ANSI Standard (NSF 61). Sealing elements for press fittings shall be factory installed EPDM.
 - 2. Press-connected fittings 1/2" – 2" press end shall have a leak-before-press feature, which assures leakage from inside the system past the sealing element of an unpressed connection. Fittings 2 1/2" – 4" press end shall have a factory installed means for visual inspection of completed press. Copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark in the tubing to ensure the tubing is fully inserted in the fitting. The joints shall be pressed using the pressing tool and jaws or jaw set, approved by the fitting manufacturer. Fitting installer shall be trained by the fitting manufacturer's factory representative.
 - 3. Press connected fittings shall be by ELKHART PRODUCTS CORP., NIBCO, VIEGA or approved equal.
- C. Exposed water piping located in finished areas shall be chromium plated or stainless steel where materials are available. For larger pipe sizes, pipe may be painted.
- D. Water service piping, up to and including 2-1/2" shall be Type K, Hard Tempered Copper, pipe sizes 3" and larger shall be ductile-iron mechanical joint. Pipe, fittings and valves shall be suitable for domestic water service and shall be in accordance with AWWA C151 standards.
- E. Grooved construction may be utilized with engineer approval on above ground copper service 2 1/2" and larger. Couplings shall be copper tubing sized installation ready Style 607. To assure uniformity and compatibility of piping components in grooved end piping systems, all grooved products utilized shall be supplied by Victaulic. Grooved butterfly valves, Series 608, may be used on grooved copper tubing systems. Grooving tools shall be supplied by the same manufacturer as the grooved components. Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. Grooved end shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove. A Victaulic factory trained field representative shall provide on-site training to contractor's field personnel in the installation of grooved piping products. Factory trained

representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

- F. Provide water hammer arrestors on hot and cold water supply piping to fixtures as indicated and/or required to prevent water hammer. Arrestors shall be factory-fabricated with stainless steel shell, hydro-pneumatic cushion of nitrogen, stainless steel bellows, and stainless-steel male threaded pipe nipples. Water hammer arrestor shall be sized in accordance with Plumbing and Drainage Institute WH201. JOSAM, ZURN or SMITH may be used.

2.5 VALVES

- A. Provide valves on piping as indicated and as required to isolate fixtures and equipment and to give complete control of water in risers and branch lines. Valves shall be ball, unless otherwise indicated. All valves shall be lead-free.
- B. No cast-iron valves shall be used on domestic hot water piping. Valves shall be bronze or brass body valves only.
- C. Valves on ductile-iron water piping shall be iron body, bronze-mounted, nonrising stem with wheel handle and shall be same class as pipe.
- D. Valves on copper water piping, up to and including 2", shall be bronze or brass. Gate Valves 2-1/2" and larger shall be cast-iron body, bronze-mounted with companion flanges. Valves on cold or chilled piping shall have extended shafts to match the pipe insulation thickness to prevent condensation. Catalog numbers indicated are NIBCO. Valves with equivalent characteristics by APOLLO or MILWAUKEE are acceptable.

<u>Type</u>	<u>Size</u>	<u>Catalog Number</u>
Ball	2-1/2" - 3"	S-FP-600A-LF
Ball	2" and smaller	S-585-80-LF
Check	2" and smaller	S-413-Y-LF

- E. Butterfly valves shall be UL-Listed, with stainless-steel disc and stem, EPDM liner, rated at 175 psi, -30 degrees to 350 degrees F. Valve shall be field repairable. Extension stem arrangement shall be used where pipe insulation thickness so dictates. NIBCO LD3022 or approved equal.
- F. Flush Valves: SLOAN numbers indicated; or equal by ZURN, DELANY acceptable.
- G. Reduced Pressure Principle Backflow Preventers: (No Lead).

<u>Size</u>	<u>Catalog Number</u>
2-1/2" and larger	375 FSC w/strainer

Provide air gap fitting on both models. WILKINS catalog models indicated, or approved equal.

2.6 VENTURI FLOW MEASURING AND BALANCING VALVES

- A. Provide venturi flow measuring and balancing valves where indicated, NUTECH Model MB for pipe size 1/2" to 2" and Model MBF for sizes 2-1/2" and larger, or approved equal.
- B. Balancing valves 1/2" thru 2" shall be constructed of bronze or brass. Valves shall be rated for 600 psi at 250°F. The valve ball ID shall be minimum standard port (one size smaller than valve connection size) Reduced port valves are not acceptable.
- C. Venturi section shall be low loss with a minimum accuracy of 3% of rate.
- D. Valves shall be provided with pressure/temperature ports and memory stop. Valves shall be equipped with metal tag and chain. Valves shall be supplied with extended handles and PT ports to clear insulation on chilled water service.

- E. Valves shall be sized as indicated or as recommended by valve manufacturer for intended flow capacity.

2.7 MIXING VALVES

- A. Provide complete mixing valves as indicated and scheduled on contract documents. Mixing valves shall meet ASSE standards for intended use as listed below. LEONARD numbers indicated, equal by POWERS or BRADLEY.
 - 1. ASSE1070: hand Lavatory

2.8 FIXTURES AND EQUIPMENT

- A. Provide complete fixtures and equipment indicated and scheduled on contract documents. Fixtures and equipment shall be as manufactured by the listed manufacturers below or approved equal. The plumbing fixtures listed below are selected to establish examples of design intent and to set a standard of quality. Equivalent fixtures and fittings from other manufactures may be submitted for approval.
 - 1. Vitreous china fixtures shall be as manufactured by KOHLER, AMERICAN STANDARD, or SLOAN.
 - 2. Stainless steel sinks shall be as manufactured by JUST, ELKAY, or ADVANCED TABCO.
 - 3. Manual faucets shall be as manufactured by CHICAGO, T&S BRASS, or MOEN.
 - 4. Sensor activated faucets shall be as manufactured by SLOAN, ZURN, or MOEN.
 - 5. Sensor activated flush Valves shall be as manufactured by SLOAN, ZURN, or DELANY.
 - 6. Terrazzo mop sinks shall be as manufactured by STERN WILLIAMS, FLORESTONE, or FIAT.
 - 7. Drinking fountains and electric water coolers shall be as manufactured by HALSEY TAYLOR, ELKAY, or HAWS.
- B. All material shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- C. Provide supply stops as required for all fixtures. Refer to plumbing drawings for additional fixture information.
- D. Provide concealed, floor-mounted, fixture support carriers for all wall-mounted plumbing fixtures, including: water closets, urinals, lavatories and water coolers. Provide floor-mounted supports with concealed arms for wall-hung lavatories. Carriers shall be as manufactured by J. R. SMITH CO., or approved equal. Contractor to select proper model to suit wall construction.
- E. All water coolers and drinking fountains are to be lead-free.
- F. Provide Owner with any special tools required to perform maintenance on fixtures and fittings.
- G. Floor drains shall be type indicated, cast-iron body with nickel bronze strainers. Where waterproof membranes occur, provide clamping collar. SMITH numbers indicated. ZURN or JOSAM may be used.
- H. Provide nickel-bronze cleanout access. Where waterproof membranes occur, provide clamping collar. SMITH numbers indicated. ZURN or JOSAM may be used.

Resilient tile floor	4020-U
Painted masonry walls 4402	
Ceramic tile floor	4020-U
Carpeted floors	4020-Y
Terrazzo floors	4020-U
Concrete floors	4020-U

2.9ELEVATOR SUMP PUMP

- A. Provide an automatic submersible dewatering pump for the elevator sump pit. Pumps shall be Series 160 as manufacturer by ZOELLER or approved equal.
- B. Construction shall be of cast iron with 100% baked-on powder coated epoxy finish for corrosion resistance and longer casting durability. All fasteners and external metal parts shall be of stainless steel. Impeller shall be of vortex non-clog design.
- C. The pump shall be a hermetically sealed, submersible type, operating in a high quality dielectric oil for cooling the windings and for lubrication of the motor bearings and ceramic-carbon shaft seal.
- D. Single phase motor shall have internal automatically resetting, thermal overload protection and shaded pole motor.
- E. Oil Smart® Controls– Provide Oil Smart pump switch to control water pumps in elevator sump. Switch shall include internal 20 amp relay and 304 stainless steel sensor probes. Provide pump control and alert system with Oil Smart Technology that shall alert residents or maintenance personnel of liquid level problems.

PART 3 - EXECUTION

3.1PIPE INSTALLATION

- A. Grade horizontal soil, waste and drain pipes as follows, except as approved and as indicated on drawings:

2"	1/4" per foot, minimum
3" and larger	1/8" per foot, minimum
- B. Install vertical soil and waste piping with provision for expansion and extend full size to and above roof lines as vents, except as otherwise indicated. Where practicable, connect two or more vent pipes together and extend as one pipe through roof at approved locations. Run concealed vent pipes in overhead spaces with horizontal waste or soil piping pitched down to stacks without forming traps in pipes, using required fittings. Where an end or circuit vent pipe from fixture or line of fixture is connected to vent line serving other fixtures, make the connection at least 4'-0" above the floor on which fixtures are located. Vent lines shall not be used as waste, except as approved. Extend cast-iron hub-and-spigot pipe inside of building 6" above the floor.
- C. Make changes in pipe sizes on soil, waste and drain lines with reducing fittings or recessed reducers. Make changes in direction by appropriate use of 45-degree wyes, longsweep 1/6, 1/8, or 1/16 bends, except sanitary tees may be used where permitted by code in soil and waste lines where change in direction of flow is from horizontal to vertical and on discharge from water closets. Short-radius fittings shall not be permitted, except in approved location.
- D. Slip joints are permitted only in trap seals or on inlet side of traps. Use hub fittings for making union connections wherever practicable, in connection with dry vents.
- E. PVC piping shall not be installed in return-air plenums, through fire walls, or any location not allowed by the Building Code.
- F. All flow measuring and balancing valves shall be balanced for flow indicated by Plumbing Contractor.

3.2CONNECTIONS TO EQUIPMENT

- A. Make plumbing connections to all equipment requiring connections, including equipment in Contract and equipment furnished by others. Make all connections according to manufacturer's recommendations.

3.3 FIXTURE SETTING HEIGHTS

- A. Plumbing fixtures shall be at heights indicated and/or directed. Heights of handicapped plumbing fixtures shall be as governed by the Building Code, ANSI A117.1 and the requirements of the Uniform Federal Accessibility Standards (UFAS).

3.4 INSPECTION AND TESTS

- A. The new plumbing system shall be tested by the Contractor in the presence of the Architect. Governing authorities having jurisdiction shall be notified of test required by them and Final Acceptance of work shall be contingent upon their approval. At least 48 hours notice shall be given prior to test. All costs of conducting test and furnishing necessary equipment for test shall be borne by the Contractor.
- B. The new soil, waste, drain and vent system shall be tested and proved tight prior to connection of fixtures, by closing all openings, except highest at roof and filling with water to point of overflow. Allow water to stand at least 2 hours before starting inspection. Where piping must be tested in sections to facilitate construction, include at least the upper 10 feet of the preceding section so that no pipe or joint in building will have been subjected to less than 10 feet head of water. Piping laid in trenches shall not be backfilled until test has been made and joints proved tight. Owner shall be provided 24 hours notice prior to tests and provided written results of tests.
- C. Upon completion of roughing-in and before setting fixtures, test new hot and cold water piping system at hydrostatic pressure of 100 psig and prove watertight at this pressure. Test water piping system to be concealed separately in same manner as prescribed for entire system.
- D. Thoroughly clean and flush piping and apply chlorine solution to new system at least 3 hours to destroy nonspore-forming bacteria. Following chlorination, flush agent from system until water is both bacteriologically and chemically satisfactory to Public Health Officer.
- E. If inspection or tests show defect, replace such defective work or materials and repeat inspection tests. Make repairs to piping with new materials. No caulking of screwed joints or holes shall be acceptable.
- F. Clean equipment, pipe, valves and fittings of grease, metal cuttings and sludge accumulated by operations of system for testing. Stoppage or discoloration or other damage to parts of building, its finish or furnishings due to Contractor's failure to properly clean piping system shall be repaired without cost to the Owner.

END OF SECTION 22 05 00

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SECTION 23 01 00 - MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. This Section forms a part of all Division(s) 21, 22 and 23 Sections.

1.2 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

- A. Latest effective publications of following Specifications, regulations, standards, codes, etc., as applicable, form a part of these Specifications the same as if written fully herein and shall be followed as minimum requirements.

Codes and ordinances of local governing agencies:

AHRI Air Conditioning, Heating and Refrigeration Institute
AMCA Air Moving and Conditioning Association
ANSI American National Standard Institute
ASHRAE American Society of Heating, Refrigerating and Air-conditioning Engineers
ASME American Society of Mechanical Engineers
ASTM American Society for Testing and Materials
IEEE Institute of Electrical and Electronics Engineers
NAFM National Association of Fan Manufacturers
NEC 2017 National Electrical Code
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
OSHA Occupational Safety and Health Administration
SMACNA Sheet Metal and Air-conditioning Contractors National Association
UFAS Uniform Federal Accessibility Standards
UL Underwriters Laboratories, Inc.
VFSR Virginia Fire Safety Regulations
VUSBC Virginia Uniform Statewide Building Code, 2018 Edition

1.3 DRAWINGS

- A. General arrangements of indicated piping, ductwork and equipment are diagrammatic only, do not scale. Where rearrangement is necessary, submit drawings of proposed changes for approval. Due to scale of drawings, offsets, fittings and accessories may not be indicated. Work indicated, but having details omitted, shall be provided complete to perform function intended without extra cost. Investigate existing structural and finish conditions in building affecting plumbing, heating, ventilating and air-conditioning work, etc., and arrange work accordingly. Furnish fittings, traps, offsets, and accessories required. Install equipment in accordance with manufacturer's recommendations and clearance requirements.

1.4 COORDINATION

- A. Coordinate piping, ducts and equipment with electrical, structural and architectural plans and work in order to avoid omissions and to eliminate any interference. Report in writing discrepancies, if found, to the Engineer as soon as possible after discovery.

1.5 WORKMANSHIP

- A. Workmanship shall be first class and of best quality in accordance with approved contemporary construction practices. Defective equipment and materials, or material damaged in the course of installation and tests shall be replaced or repaired in an approved manner.

1.6 CUTTING

- A. Cutting shall be carefully done. Repair damage to the building, piping, wiring, or equipment as a result of cutting for installation, using skilled mechanics of trade involved.

1.7 APPROVAL OF MATERIALS, FIXTURES AND EQUIPMENT

- A. See Specification Section 01 33 00 "Administrative Requirements", for shop drawing submittal procedures. Within 30 days after award of the Contract and before any purchases are made, submit for approval a complete list of materials, fixtures and equipment proposed, together with names of manufacturers and catalog numbers for each Specification Section. Furnish other detailed information where directed. No consideration will be given to partial lists submitted from time to time. Approval of materials shall be based on manufacturer's published ratings. Materials, fixtures and equipment listed which are not in accordance with specified requirements shall be rejected. Contractor shall make resubmission of items not approved within 30 days from date of rejections. Submission shall be complete with description, ratings, dimensions and related items and any additional information required by the Architect.
- B. Materials and equipment shall be new, conforming to these Specifications.
- C. Mechanical design has given full consideration to space requirements for equipment specified. Contractor is responsible for selecting equipment that will be accommodated by this space. Equipment not conforming to space allotted shall be rejected.
- D. Mechanical design has given full consideration for electrical requirements for equipment. Contractor is responsible for selecting equipment that will be accommodated by the electrical design indicated. Equipment not conforming to the electrical design provided under Division 26 is the Contractor's responsibility. All electrical changes required to accommodate the equipment provided shall be furnished and installed by the Contractor without change in Contract price or time of completion. This shall include but not be limited to wiring, conduit, circuit breakers, disconnect switches, starters and controllers.
- E. Submit one copy of equipment installation manuals to the Engineer for his use.

1.8 EQUIPMENT DESIGN

- A. Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with ASME, ANSI, IEEE, or other applicable technical standards, suitable for maximum working pressure and shall have neat and finished appearance.

1.9 SUPERVISION

- A. The Contractor for each Section under this Division shall maintain a competent foreman on the job at all times to supervise the work and coordinate with other trades for the installation of the system. Submit foreman's qualifications, including master's trade license, to the Engineer for approval.

1.10 NOTICES AND FEES

- A. Give all required notices, obtain all necessary permits (including a separate permit for the installation of refrigerant lines if required by the local "Authority Having Jurisdiction") and pay all required fees.

1.11 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Specification Section 01 70 00 "Execution and Closeout Requirements".

1.12 OWNER'S TRAINING

- A. Upon completion of work and at a time designated by the Architect, the services of competent persons shall be provided as required to instruct Owner's representative in operation and maintenance of systems. Training sessions shall be a combination of on-site and in-classroom training and shall be a minimum of one 4-hour session. All training shall be video recorded by the Contractor and provided in DVD format. Two copies of the DVD shall be submitted to the Owner.

1.13 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from date of Substantial Completion.
- B. The equipment manufacturer and Contractor shall provide a one-year material, labor and refrigerant warranty on all compressors. In addition, the manufacturer shall provide a material only warranty on all compressors for a period of 5 years total, beginning at the date of start-up of the compressor.

PART 2 - PRODUCTS

2.1 PIPE SLEEVES, PIPE HANGERS, PIPE SUPPORTS, DUCT SUPPORTS AND FIXTURE SUPPORTS

- A. Provide pipe sleeves, hangers, supports, duct supports and fixture supports. Contractor shall be responsible for proper and permanent location. Pipe and duct shall not be permitted to pass through footings, beams, or ribs, unless indicated and/or approved. All piping passing through masonry or concrete walls shall be sleeved and insulation shall run continuously through sleeve.
- B. Install pipe sleeves and properly secure in place with grout where pipes pass through masonry or concrete and at all fire-rated assemblies. Pipe sleeves, except in footings, shall be sufficient diameter to provide approximately 1/4" clearance around insulation or pipe. Fill void between insulation or pipe and sleeve with mineral wool to prevent sound transmission. Pipe sleeves in walls, floors and partitions shall be Schedule 40 steel pipe. Extend sleeves above floor at least 1", pack space around pipe with fireproof material and make watertight. Pipe penetration through below grade walls shall be sealed with modular seals selected for the type of pipe and wall penetration, "LINK SEAL" or approved equal. Where pipes pass through waterproofing membranes, provide flashing sleeves with integral flashing flanges or clamping device of 16-ounce soft-sheet copper; extend at least 8" from sleeve. Thoroughly mop flashing flanges and shields into membrane.
- C. Hang horizontal overhead runs of pipe with adjustable clevis-type hangers spaced not over 10 feet apart, except space soil pipe hangers not over 6 feet apart. Provide hangers other than aforementioned, if pipe size or other features make spacing at shorter intervals necessary. Pipe hangers shall be provided within 4 feet of all changes in direction of pipe. Pipe hangers shall not be installed on pipe fittings where fitting could bear the weight of connected pipe but instead shall be installed on pipe at intervals previously specified. Chain, strap, perforated bar, or wire hanger will not be permitted. Hangers shall have short turnbuckles or approved means of adjustment, except turnbuckles may be omitted on hangers for soil or waste pipe from individual toilet rooms to main stack when space does not permit their use. Use spring-type hangers where required. Use trapeze hangers on pipes running parallel and close together. Inserts shall be cast iron or cast steel, of type to receive machine bolt in one horizontal direction and shall be installed before concrete is poured.
- D. Hang all horizontal overhead runs of pre-insulated refrigerant pipe with a pipe shield as manufactured by EATON B-LINE, series SNAP'N SHIELD or approved equal. Hang all horizontal overhead runs of field insulated refrigerant piping with a clamp assembly attached to strut as manufactured by EATON B-LINE, series B-LINE ARMAFIX CLAMPS or approved equal.

Refrigerant pipe insulation shall be continuous through the clamp assembly. All refrigerant pipe supports shall be spaced not over 6 feet apart.

- E. Refrigeration piping and condensate piping on roof shall be supported by support blocks manufactured by ROOF TOP BLOX model RTB-01, or approved equal. The support blocks must be designed to eliminate roof penetrations, flashings or damage to roofing membrane. Support body shall be made of recycled UV-resistant Polypropylene Copolymer. Base platform material shall be 1" thick, 25psi, type 4 closed cell structural foam to distribute and evenly cushion loads. Support top surface shall have molded in pipe organizing saddles and strut mounting cradle. The top surface shall also have screw guide indents and engineered internal screw thread gripping feature. Block must accept up to 1/2" threaded rod using side entry nut slots to allow fast top side assembly and piping height adjustments or attachment of galvanized slotted steel strut channel. For roof mounted piping provide approved pipe supports every four feet for Polyvinyl Chloride (PVC) and every six feet for Copper. Provide polycarbonate securing brackets model SCB07. Brackets shall secure support directly to the roof membrane with M-1 structural adhesive.
- F. Supports for piping, ductwork and equipment shall be attached to a structural member, not bridging. Piping, ductwork and equipment shall not be attached to structural joist bridging or metal roof or floor decking. Provide additional steel supports spanning between joists or beams for hanger attachments. Additional steel supports shall be approved by the Structural Engineer.
- G. In areas supported by steel beams, secure hanger rods directly to beams.
- H. Support vertical lines from lowest story with base fittings set on concrete or brick pier or by hangers and supports where directed.
- I. Provide galvanized steel shields or protection saddles to protect insulation at area of contact with hangers and supports. Where shields are used on pipes 1-1/2" and larger, provide insulation inserts at points of hangers and supports. Refer to Specification Section 23 07 00 "Mechanical Insulation", for details.
- J. Support and fasten fixtures and equipment in an approved manner.
- K. Ductwork shall be supported in accordance with SMACNA, HVAC Duct Construction Standards, unless otherwise noted or indicated. Ductwork shall be supported using threaded rod or solid metal strap as required by SMACNA. No other materials, such as perforated metal strap, or cloth strap, are acceptable. Wire may be used to hang round duct smaller than 10"; however, solid metal strap shall be used to wrap around duct. Wire shall not be used for rectangular duct or round duct larger than 10".

2.2 DUCT AND PIPE PENETRATIONS THROUGH FLOORS AND WALLS

- A. Fit exposed pipes passing through floors or finished walls with escutcheon of chromium-plated cast-brass plates on chromium-plated pipe, nickel-plated steel plates on ferrous pipe, or copper tubing. Plates shall be large enough to completely close hole around pipes and conceal pipe sleeves and shall be round, with least dimension at least 1/2" larger than diameter of pipe and insulation. Secure plates in an approved manner.
- B. Fit ductwork passing through walls with 22-gauge galvanized sheet-metal sleeves. Sleeves shall be large enough to completely close hole around duct and shall be at least 1/2" larger than outside dimensions of duct and insulation. Provide flanges on both sides of penetrations to cover the wall edge. For uncovered ducts, sleeves shall be of same material as duct. Secure sleeves and flanges in an approved manner.
- C. Ducts passing through fire walls, smoke partitions, fire partitions, or floors shall be sealed with a UL rated system appropriate for the specified fire rating.

2.3 UNIONS

- A. Unions shall be installed on each side of all control valves, regulators and similar items and one side of all pieces of equipment, such as pumps, tanks, etc., so that such equipment shall be readily disconnected and removed if necessary.

2.4 DIELECTRIC CONNECTIONS

- A. Dielectric connections shall be provided at all connections between ferrous and nonferrous piping or metals, except drain piping connections at drain pans for cooling coils and valves having cast-bronze adapters.

2.5 ELECTRICAL WORK FOR EQUIPMENT UNDER MECHANICAL SYSTEMS

- A. All non-integrated motor controllers and starters serving equipment installed under Division 23 Sections shall be furnished under those Sections and shall be turned over to Electrical Contractor, for installation by Electrical Contractor. Controllers shall be equipped with all auxiliary contacts, poles, or devices necessary to permit interlocking and control required.
- B. Fractional horsepower motors 1/2 HP and below shall be single-phase, 60 cycles, 120V; motors larger than 1/2 HP shall be 3-phase, 60 cycles, of voltages indicated on the electrical drawings and conforming to the electrical service, except where indicated otherwise. Motors shall conform to latest NEMA requirements.
- C. All electrical power wiring required for equipment installed under Division 23 Sections shall be provided under Division 26 Sections with all necessary approved wiring diagrams and guidance provided under Division 23 Sections, with the exception of power wiring to Automatic Temperature Control panels which shall be provided by the Automatic Temperature Control Contractor.
- D. Raceways shall be 1/2" minimum. All wiring in rooms with exposed structure or in inaccessible ceiling and walls shall be installed in conduit. Label the front face of the cover on each junction box with indelible black marker indicating the number of each circuit contained in or running through the box. In areas where exposed construction is the final finished condition and conduit and junction boxes are called out to be painted, label the inside face of the covers.
- E. All control and power wiring required for temperature control system and all interlocking and accessory control wiring required for equipment installed under Division 23 Sections shall be installed by the Plumbing, Mechanical and Temperature Control Contractors.
- F. Manual starters shall be manual single-, double-, or three-pole type designed for flush or surface mounting, with overload protection in each phase.
- G. Starters for motors under automatic control shall have built-in "hand-off-auto" selector switch.
- H. All starters and controls shall be NEMA rated and NEMA I enclosed where mounted inside building, except in kitchens which shall be NEMA 4X-SS. Starters and controls mounted outside or where specifically called for shall be NEMA 3R. Explosion-proof enclosures shall be used in hazardous areas and where specifically called for. Combination switch and magnetic starters shall be provided where indicated.
- I. Auxiliary 120-Volt contacts shall be provided to give control and interlocking as required or as indicated.
- J. Where control voltages are different from motor voltages, a control-voltage transformer shall be provided as a part of the starter.
- K. The Contractor shall be responsible for coordinating with the Division 26 Contractor for providing properly sized circuit breakers to serve equipment and motors furnished which differ from that specified or indicated. This shall be further understood to include branch circuit wiring, conduit, disconnect switches, etc., in accordance with the appropriate codes and specifications. The cost of providing this increased electrical service and related work shall be included under the applicable section under which the equipment and motors are being furnished, at no additional cost to Owner.

2.6 DUCT SEALANT

- A. Where duct is indicated to be sealed, utilize a fire resistive, water based, indoor/outdoor, U.V. resistant, non-fibred duct sealant, DUCTMATE EverSeal, FOSTER DUCT-FAS 32-19 or approved equal.
- B. Sealant shall have a volatile organic compound (VOC) rating of 24 g/L, less water.
- C. Sealant shall meet all SMACNA pressure classes up to 10" w.g. and SMACNA seal classes A, B and C.
- D. Apply sealant with brush working sealant into all joints. For spiral duct, apply sealant to male end of coupling prior to fitting straight run of duct to coupling. Follow manufacturer's instructions for all application requirements.
- E. The use of duct sealing tape of any kind is unacceptable.

2.7 CEILING ACCESS DOORS

- A. The Contractor shall furnish and the General Contractor shall install prime coated steel (type 304 stainless steel, #4 satin polish finish, fire rated) access doors with lock where required, style necessary for surface in which placed, sizes as indicated or required for access to equipment, valves, dampers, filters, duct smoke detectors and all other devices requiring access ACUDOR PRODUCTS, INC. model UF-5000 SCS—prime coated (SCSS –stainless) or approved equal.
- B. Access doors shall have same fire rating as ceiling, floors, walls and partitions in which installed.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

- A. Pipe systems shall be complete. Pipe shall be of size indicated or, where not indicated, shall be of size required to produce capacities of the equipment specified. No pipe shall be buried in floors, unless specifically indicated or approved.
- B. Install runs of piping as indicated. Cut pipe accurately to measurements established at the building by the Contractor and work into place without springing or forcing. Do not cut or move any structural portions of the building without approval. Run piping above ground, parallel with lines of buildings, unless otherwise shown or specified.
- C. Unless otherwise indicated, connections to equipment shall be as shown by manufacturer's data. Make piping connections to equipment with unions or flanged connections arranged so that equipment can be dismantled without disturbing the piping installation. Unions shall be accessible after building is complete. Provide valves to isolate equipment for service or removal.

3.2 EQUIPMENT INSTALLATION

- A. Erect equipment in neat and workmanlike manner. Align, level and adjust for satisfactory operation. Install so that connecting of piping and accessories can be made readily and so that parts are easily accessible for inspection, operation, maintenance and repair. Minor deviation from indicated arrangements may be made as approved by Architect.

3.3 EQUIPMENT SUPPORTS

- A. Design and construct supporting structures of strength to safely withstand stresses to which they may be subjected and to distribute properly the load and impact over building areas. Conform to applicable technical societies' standards, also to codes and regulations of agencies having jurisdiction. Obtain approval before fabrication.

- B. Fasten ceiling-hung equipment to building structures or inserts as approved.
- C. The Contractor shall submit for review physical data for each unit supported from the building structure, either suspended from or attached to the building structure. The physical data shall include the equipment operating weight, corner weights, and center of gravity.

3.4 NOISE AND VIBRATION

- A. Mechanical and electrical equipment shall operate without objectionable noise or vibration as determined by the Architect.
- B. If such objectionable noise or vibration should be produced and transmitted to occupied portions of building by apparatus, piping, ducts, or other parts of mechanical and electrical work, make necessary changes and additions as approved, without extra cost to the Owner.
- C. Isolators shall prevent, as far as practicable, the transmission of vibration, noise, or hum to any part of building.
- D. Isolators shall suit vibration frequency to be absorbed. Provide isolator units of area and distribution to obtain proper resiliency under load and impact.

3.5 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Responsibility for care and protection of mechanical equipment rests with Contractor until Substantial Completion of the work.
- B. After delivery, before and after installation, protect equipment and materials against theft, injury, the environment, or damages from all causes.
- C. Protect plumbing fixtures and other equipment with enamel or glaze surfaces from damage by covering and/or coating as approved.
- D. Protect equipment outlets and pipe openings with temporary plugs or caps.
- E. During construction, seal off all openings into interior of equipment and ductwork with sheet metal or taped polyethylene sheathing to prevent infiltration of dust.
- F. Equipment not designed for exterior installation (i.e., split system indoor unit, etc.) shall not be delivered to the job site until a location protected from the environment is provided. Location must be approved by the Architect and Engineer prior to delivery.
- G. Equipment suitable for exterior installation (i.e., condensing unit, etc.) shall not be delivered to the job site until it is ready to be installed in its permanent location.

3.6 CONTRACTOR'S RESPONSIBILITY FOR MANUFACTURER'S AUTHORIZED FIELD START UP

- A. The equipment manufacturer shall furnish a factory-trained and certified service technician without additional charge to start the HVAC equipment. This individual's certifications shall be submitted as a shop drawing along with the equipment and shall be reviewed and approved by the Engineer. Unit manufacturers shall maintain service capabilities no more than 100 miles from the job site.
- B. The HVAC equipment to be started by the manufacturer's certified technician shall include:
 - 1. Split system air conditioning units
- C. The manufacturer shall furnish complete submittal wiring diagrams of the HVAC equipment as applicable for field maintenance and service.
- D. Start-up sheets on all equipment shall be submitted and reviewed by the engineer. An approved copy shall be included in the final TAB report. If required, this same representative shall be made available to review the startup sheets onsite with the Engineer and Owner.

3.7 CONTRACTOR'S RESPONSIBILITY FOR TESTING, ADJUSTING AND BALANCING (TAB)

- A. Provide the TAB Agency a full set of Contract Documents (drawings and technical specifications), all manufacturers' approved submittal data and copies of revised data as soon as possible.
- B. Ensure that a current TAB Engineer's certification certificate is kept on file.
- C. Ensure all systems have been installed and are in 100% working order before the TAB Engineer is called to the job site, including but not limited to ductwork, piping, terminals, electrical and ATC. The Contractor shall verify that each item of the Pre-TAB Checklist (see Appendix A) has been completed and shall deliver a signed copy of the Pre-TAB Checklist to the Owner's Representative and the TAB Agency attesting that the project is complete and ready for TAB work to begin.
- D. Provide adequate access to all points of measurement and adjustment and ensure that all dampers operate freely.
- E. Provide a factory representative for all major pieces of equipment as requested by the TAB Agency to assist in operation and performance verification of equipment.
- F. Cooperate with the TAB Agency to help operate and adjust the control systems directly related to TAB work and provide any specialties required to make such adjustments.
- G. Carefully review the drawings and Specifications for the various systems noting all facilities incorporated in the design for purposes of adjusting and balancing. Should it be deemed necessary to provide additional dampers, baffles, valves, or other devices which would aid in the required adjusting and balancing, same shall be provided by the installing contractor.

3.8 CLEANING, PAINTING AND IDENTIFICATION

- A. Remove from site excess material, equipment protection, etc. Thoroughly clean piping, hangers, equipment, fixtures and trimmings and leave every part in perfect condition ready for use, painting, or insulation as required.
- B. Paint exterior surfaces of equipment supports and other ferrous metal work, except that which is galvanized, with one coat of RUSTOLEUM damp-proof red primer, or approved equal.
- C. Refrigerant piping service shall be indicated with outdoor grade 3.2 mil thick high gloss adhesive backed vinyl labels which identify the service by name (not initials). Provide labels similar to Brimar, EZ Pipe Markers. Labels shall be used wherever piping is exposed, at all unit connections and at 25-foot intervals for concealed piping located above accessible ceilings. Label and arrow heights shall be 1".

3.9 EQUIPMENT MARKING

- A. Label all mechanical equipment.
- B. Labels be machine engraved, laminated, 1/8" thick, Bakelite, nameplate type. Labels shall be black faces with white letters.
- C. Labels shall have 1/4" high letters.
- D. Labels shall be rigidly attached using rivets or screws. Adhesive backing is not acceptable.

3.10 EQUIPMENT INVENTORY

- A. Provide a complete equipment inventory for all Mechanical, Plumbing and Fire Protection equipment included in the project scope of work. Refer to Appendix B of this section for the required template. A separate form shall be provided for each new piece of equipment provided.
- B. Prior to substantial completion, submit the equipment inventory forms for review. Once approved, include the forms in the operation and maintenance manual.

APPENDIX A

PRE-TAB CHECKLIST

A. GENERAL

1. All components of the HVAC system have been installed, including controls and control wiring.
2. Power wiring has been installed and energized to all motorized equipment. Also, all line voltage control wiring required has been installed.
3. All equipment has been started and run tested through all specified sequences of operation by factory-authorized representatives and all safety controls have been verified to be operational.
4. All required testing of piping and duct systems has been completed in accordance with the drawings and specifications.

B. AIR DISTRIBUTION AND VENTILATION SYSTEMS

1. Access doors have been installed where required to allow inspection and servicing of duct-mounted dampers, equipment and components.
2. Fans are rotating in correct direction. Fans have been lubricated. Drive pulleys are aligned and belt tension is correct. Setscrews are tight securing keys into key-ways. Fan wheels turn freely and are balanced. Belt guards are in place.
3. Vibration isolators and flexible connectors have been installed where required. With fans in operation, there is no excessive vibration of fan assemblies or ductwork.

I, _____ an authorized representative of
(Signature and Title)

(Company)

attest that all items contained in the above Pre-Tab Checklist have been completed

and verified as of this date: _____.

APPENDIX B

Equipment Inventory Template

Project Name: **(Add Project Name)**

Project Address: **(Add Project Address)**

Description of Item: _____
(i.e., Air Handling Unit, Ductless Split System, etc.)

Classification:

- HVAC
- Plumbing
- Fire Protection

Building: _____

Equipment Location (Room Number): _____

Date Purchased: _____

Date Placed in Service: _____

Original Cost: _____

Life Expectancy (years): _____

Estimated Replacement Date: _____

Estimated Replacement Cost: _____

Manufacturer: _____

Model/Serial #: _____

END OF SECTION 23 01 00

SECTION 23 05 00 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 23 01 00 "Mechanical General Provisions" apply to this Section.

1.2 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of material and workmanship for a period of 12 months from date of Substantial Completion of the building. Refer to Section 23 01 00 for additional warranty period responsibilities.

1.3 SUBMITTALS

- A. Prior to fabrication of any ductwork, Mechanical Contractor shall prepare and submit for review and approval 1/4" scale ductwork shop drawings. Drawings shall indicate all equipment locations and double line ductwork layout. Drawings shall be coordinated with existing conditions and Architectural, Structural, Sprinkler and Electrical Drawings.
- B. Submit manufacturer's performance data and unit details on all products specified below or indicated on drawings.

1.4 PROTECTION OF EQUIPMENT AND MATERIAL

- A. All equipment and material not specifically designed for exterior installation shall not be delivered to the job site until an indoor, dry location is available for storage. All equipment and material shall be covered and protected from dirt, debris, moisture, paint, coatings and damage of any kind. Store off the floor, in a location approved by the Owner, to prevent contact with water.
- B. All air-conveying equipment and material, including but not limited to split systems and ductwork shall be kept clean as described above and all airside surfaces shall be wiped clean (metal surfaces) prior to installation. Where equipment surfaces are subject to additional accumulation of dirt and debris, interior cleaning shall be done after the completion of ductwork installation at all unit openings.
 - 1. Exterior surfaces of all equipment shall be cleaned at completion of construction in a manner that condition and appearance of equipment is the same as it left the factory.
 - 2. No equipment shall be run without approval by the Engineer.

PART 2 - PRODUCTS

2.1 HEAT GENERATION (NOT USED)

2.2 REFRIGERATION (NOT USED)

2.3 AIR HANDLING EQUIPMENT (NOT USED)

2.4 UNITARY EQUIPMENT

- A. Split System (IU/OU-1):

1. Unit shall be size, type, and have capacity indicated DAIKIN, TRANE, YORK, or approved equal. Units shall meet or exceed efficiencies scheduled on the drawings.
2. Unit shall be horizontal mounted for ducted application. Unit shall be complete with casing, blower, filter, heat exchanger, reversing valve, controls, and condensate trap and drain assembly.
3. Evaporator coil shall be constructed of copper tubes and aluminum fins and shall be internally cleaned and provided with refrigerant holding charge. Coil casing shall be pre-painted steel. Piping connections shall be sweat fittings.
4. Fan motor shall be open drip proof with internal overloads.
5. Provide 24-volt control transformer with control circuit fuse to protect transformer from overload.
6. Provide duct flanges for supply duct connections. Return connections shall be either right or left side as indicated on drawings.
7. Provide blower door safety switch to interrupt electrical power at the unit when the panel covering the blower compartment is removed.
8. Provide filter rack with 2" MERV 8 disposable filters.
9. Blower cabinet shall be insulated.
10. Provide auxiliary and main drain pans. Install float switch in main drain pan. Switch shall disable unit upon activation.
11. Condensing Unit
 - a. Unit shall be size, type, and have capacity indicated. DAIKIN, TRANE, YORK, or approved equal.
 - b. Outdoor unit shall be complete with scroll compressor, external service valves, charging port, condenser coil, and condenser fan.
 - c. Condenser coil shall be constructed of copper tube and aluminum fins. Fins shall be protected with a decorative grille.
 - d. Compressor shall be internally protected against high pressure and temperature. This shall be accomplished by the simultaneous operation of the high-pressure relief valve and a temperature sensor which protect the compressor if undesirable operating conditions occur. Compressor shall be isolated to prevent vibration.
 - e. Provide liquid line filter dryer factory installed. Secured re-usable service valves shall be provided on both the liquid and suction sweat connections for ease of evacuation and charging.
 - f. Condenser fan motor bearings shall be long life permanently lubricated requiring no annual servicing.
 - g. Cabinet shall be made of pre-treated and powder-coated heavy-gauge steel.
 - h. Refer to warranty requirements in Section 23 01 00.

2.5 TERMINAL EQUIPMENT (NOT USED)

2.6 HVAC PIPING AND SPECIALTIES

A. PIPING

1. Refrigerant and HVAC drain piping shall be provided as specified below. Where options of different materials are given for the same service, contractor shall select materials and use them uniformly throughout the system. Contractor shall submit experience with all of the materials and joining methods specified.
2. Condensate drain piping:
 - a. Above ground (within building and plenum rated ceiling)
 - 1) Type L copper
3. Refrigerant piping:
 - a. Above ground

1) Copper Type ACR

4. Type L copper pipe shall conform to ASTM B42, and be assembled with wrought-copper soldering fittings using 95-5 solder or with press on fittings as specified herein:
Grooved to manufacturer's Standard Roll Grooving Specifications.
5. ACR tubing shall be nitrogen-filled assembled with wrought-copper soldering fittings using silver solder.
6. Piping shall be run concealed, except where no ceiling is provided. Coordinate installation of piping with other disciplines. Locate all piping tight against structure where possible. No piping shall be installed below mechanical equipment, or within mechanical or electrical equipment clearance requirements.

2.7 AIR DISTRIBUTION

A. Ductwork

1. Provide all ducts, connections, dampers, and related items required to form a complete system as indicated on drawings and specified herein.
2. All ductwork shall be sheet metal.
3. Sheet-metal ducts shall be fabricated from G60 galvanized-steel sheets, 304 stainless steel, or 3003 aluminum, and shall be of gauges called for and as detailed in 2005 SMACNA Manual, HVAC Duct Construction Standards (Metal and Flexible). All constant volume ductwork shall be 1" w.g. pressure class construction and shall be single-wall rectangular or round.
4. Duct sealing requirements shall be Class A for all ductwork.
5. All companies being considered as potential suppliers of duct and fitting components shall submit drawings and dimension data for approval. These submittals will serve as a basis for acceptance or rejection of product.
 - a. All fittings furnished for use on a project must be identical to the approved submittal data.
 - b. Any fittings rejected by the project engineer shall be replaced with fittings equal to the original approved submittals. All expenses incurred in the replacement of fittings that do not conform to these requirements shall be the responsibility of the installing contractor.
6. Duct shall be provided in continuous, un-joined lengths wherever possible.
7. Insulation shall have the following UL rating:

Flame Spread	10-20
Fuel Contributed	10-15
Smoke Developed	0-20
8. Rectangular low velocity ductwork shall be constructed from galvanized steel sheets of lock form quality per ASTM A653 with a G60 zinc coating (0.60 oz/ft²), unless otherwise shown on the contract documents. Sheets shall be free of pits, blisters, slivers, and un-galvanized spots.
9. Insulated-flexible acoustical air ducts shall be FLEXMASTER USA TYPE 1M, THERMAFLEX Type M-KE, or approved equal, suitable for up to 10" w.g. positive pressure and rated velocity of 5500 FPM. Flexible ductwork shall meet NFPA 90A standards, conform to UL standard 181, and be ETL listed Class 1 air duct. Flexible duct shall have a flame spread of less than 25 and smoke developed of less than 50. Flexible ductwork shall be fabricated with a polyethylene or chlorinated polyethylene inner film, wrapped in 2" thick with a thermal conductance of R-6 fiberglass insulation, with an outer reinforced metallized vapor barrier. The inner film shall be supported by a corrosion resistant galvanized steel helix formed and mechanically locked to the polyethylene fabric. The inside bend radius shall be ½ x inside diameter in all sizes. Flexible branch ductwork to diffusers shall be limited to maximum length of 5 feet long and maximum velocity of 600 feet per minute.

Flexible duct connections at variable air volume terminals shall be a maximum of 3 feet long. Supports shall not compress or constrict the flexible duct.

10. Provide flexible connections of fiberglass between ducts and fan coil units. Connector shall be constructed using double lock gripping fingers at metal to fabric contact. Connector shall be rated airtight and watertight up to 10" w.g. positive to 10" w.g. negative pressure. Provide flexible connections, not less than 4 inches wide, constructed of approved fireproof, waterproof, non-asbestos, glass fabric, at the inlet and outlet connection of each fan unit, securely fastened to the unit and to the ductwork by a 24 gauge galvanized steel band provided with tightening screws. There shall be no metal-to-metal contact at flexible connections. There shall be no stretching of the flexible material at flexible connections. The connection shall be UL listed, to meet NFPA 90A and 90B requirements and the following applications:

Indoor: Neoprene coated glass fabric, minimum 30 oz./sq.yd., DUCTMATE "PROFLES™" or approved equal.

Outdoor: U.V. resistant Hypalon coated glass fabric, minimum 24 oz./sq.yd. DUCTMATE "PROflex™" or approved equal.

11. Fabricate ductwork with airtight joints, presenting smooth surface on inside, neatly finished on outside; construct with curves and bends to aid in easy flow of air. Unless otherwise indicated, make inside radius of curves and bends at least width of ducts. Where square elbows have to be used, provide double wall turning vanes in all elbows. Deflecting vanes shall be double wall blades, fit into side rails, and screw or rivet to duct elbow in field. Blades and side strips shall be small or large double vanes as detailed in SMACNA Duct Manual. DUCTMATE "PROrail™" or approved equal.
12. Construct, brace, and support ducts and air chambers in a manner that they will neither sag nor vibrate to any perceptible extent when fans are operating at maximum speed or capacity.
13. Provide sandwich type or square framed access doors for service temperature and pressure required, where indicated and where not indicated, in locations and of sizes which will afford easy access to multi-blade dampers, fire dampers, and other equipment and devices requiring inspection and servicing. Access doors shall be installed to avoid lights, piping, conduit, ceiling grid, etc., to provide unobstructed access. Access doors shall be installed on the underside of the ductwork. Access doors shall be a minimum of 24" x 18" where possible. Access doors in all factory fabricated ductwork shall be factory installed and sizes and locations shall be identified on the ductwork shop drawing submittal. In non-accessible ceilings, provide access doors in ceiling. DUCTMATE or approved equal.
14. Make sheet-metal connections to masonry work airtight and watertight in approved manner.
15. Duct sizes are inside free area. Increase duct sizes as required.
16. Ductwork and accessories shall not be delivered to the job site until just prior to erection and must be stored in an approved manner.
17. All ductwork shall be internally cleaned by vacuuming prior to installation.
18. All ductwork open ends shall be sealed with polyethylene and duct tape during construction after hanging.

B. Fire Dampers:

1. Provide suitably constructed fire dampers where indicated and where required by NFPA 90A or by local ordinance or by Virginia State Fire Marshal.
2. Fire dampers shall be fusible link actuated, constructed and installed per details in NFPA 90A, and shall be UL labeled. Fire dampers shall provide 100% free area with no restrictions in the airstream. Dampers shall be suitable for horizontal or vertical mountings. All fire dampers must be inspected after installation by the authority having jurisdiction.

C. Grilles:

1. Refer to drawings for types, material, models, finishes as manufactured by PRICE, TITUS, METALAIRE, or approved equal. Air devices shall have performance characteristics (throw, noise, and pressure drop) equal to air devices scheduled on the drawings. This information shall be provided with the submittal.
2. Grille and register frames and louvers shall be one-piece construction.
3. Paint interior surfaces of ducts behind grilles and registers with flat black enamel.

2.8 VIBRATION ISOLATION

A. Vibration Isolators:

1. Mechanical equipment indicated below shall be isolated from the structure by resilient vibration and noise isolators. Equipment to be isolated includes fan coil units. . . . Minimum deflection shall be 1".
 - a. Hangers shall be pre-compressed and locked at the rated deflection by means of a resilient upstop to keep the equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30° capability. Hangers shall be type PC30N as manufactured by Mason Industries, Inc. or equal.

Springs shall be seated in a steel washer reinforced neoprene cup that has a neoprene bushing projecting through the bottom hole to prevent rod to hanger contact. Spring diameters and the lower hole sizes shall be large enough to allow the hanger rod to swing through a 30° arc from side to side before contacting the cup bushing.

2.9 MEASUREMENT AND CONTROL

A. Low Voltage Condensate Overflow Shut-off Switch

1. Low voltage condensate overflow shut-off switches shall be installed on all condensate drain pans as manufactured by RECTORSEAL approved equal.
2. The condensate shut-off switch shall detect rising water in condensate drain pans and interrupts the thermostat circuit to shut off the unit before flooding occurs. The device shall be installed on the primary drain pan rim with a two-piece clamp system that does not require drilling.
3. The switch shall incorporate a high capacity 5-amp, 24 volt AC magnetic float switch in a fully housed protective cover. The housing shall include a pull up test knob for functional testing of system.
4. The switch shall include an alarm wire to connect to the BAS. The switch shall send an alarm signal to the BAS frontend workstation. The mechanical contractor shall be responsible for coordinating the switch connections with the controls contractor.
5. The switch shall be UL Listed to comply with UL 508.

PART 3 - EXECUTION

3.1 TESTS

- A. Refer to Section 23 05 93 "Testing, Adjusting and Balancing" for related requirements.
- B. At his discretion, the Owner shall be represented at all tests. Contractor shall provide 48 hours' notice to the Owner prior to the tests unless otherwise specified.
- C. Refrigerant piping shall be tested with dry nitrogen and trace of refrigerant at test pressures recommended by equipment manufacturer. After system has been proven tight under test pressure, it shall be evacuated to a pressure 2.5 mm Hg absolute. The refrigerant compressor

shall not be used for evacuating the system. Vacuum shall be checked by use of a mercury manometer.

END OF SECTION 23 05 00

SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING (TAB)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 23 01 00 "Mechanical General Provisions" apply to this Section.

1.2 SCOPE OF WORK

- A. The General Contractor shall obtain the services of an independent testing and balancing agency whose business is limited to testing, adjusting and balancing and shall be certified by AABC (or NEBB). Agency shall have been in the TAB business for a minimum of 5 years. The TAB (Testing, Adjusting and Balancing) Agency shall be a direct subcontractor of the General Contractor and not affiliated in any way with the Mechanical Contractor.
- B. Testing and balancing shall be performed in accordance with National Standards for Testing and Balancing Heating, Ventilating and Air-conditioning Systems, 2002, as published by Associated Air Balance Council (AABC).
- C. All work shall be performed under the direct supervision of a certified TAB Engineer. All other personnel shall be regular full-time employees of the TAB Agency.
- D. Test and Balance Agency shall submit within 30 days after receipt of construction contract two copies of qualifications, including current TAB Engineer's certificate and National Project Certification Performance Guaranty.
- E. TAB work shall not commence until all components of the HVAC system have been installed completely, including all power wiring and controls and all equipment has been started and run tested in each mode of operation. Should any items be found incomplete at the time that TAB work is performed, the TAB Agency shall immediately notify the General Contractor and Owner's Representative of any deficiencies found. The General Contractor shall be responsible for correcting reported deficiencies and verifying that the system is 100% complete, operable and ready for TAB work to proceed.

PART 2 - PRODUCTS

2.1 MATERIAL AND EQUIPMENT

- A. Provide all necessary instrumentation required to measure and adjust the HVAC air systems.
- B. Equipment and instruments shall be of types approved by the Owner's Representative and/or manufacturers of devices installed.
- C. Instruments used for testing and balancing of air and hydronic systems shall have calibration verified within a period of 12 months prior to balancing.

PART 3 - EXECUTION

3.1 GENERAL, MECHANICAL AND ELECTRICAL CONTRACTOR'S RESPONSIBILITY

- A. The General Contractor shall be responsible for directing the Mechanical and Electrical Contractors to fulfill the Contractors' Responsibility for Testing, Adjusting and Balancing as required in Section 23 01 00. TAB work shall not commence until the conditions of paragraph 1.2.E of this Section and all requirements of Section 23 01 00 for TAB have been completed.

3.2 TAB AGENCY'S RESPONSIBILITY

- A. Carefully review the drawings and Specifications for the various systems noting all facilities incorporated in the design for purposes of adjusting and balancing. Should it be deemed necessary to provide additional dampers, baffles, valves, or other devices which would aid in the required adjusting and balancing, same shall be provided by the installing contractor.
- B. The TAB Agency shall report any and all deficiencies that prohibit adjusting and balancing in accordance with the Contract Documents to the Contractor and the Owner's Representative.
- C. Adjust all duct and equipment, including controls, dampers, etc., to properly perform to $\pm 10\%$ of their respective design quantities of flow.
- D. Determination of the air volumes shall be made by pitot tube and differential draft gauge for all supply and return air ducts. Openings for pitot traverses shall be provided as required and shall be fitted with neat removable plugs or covers.
- E. The Test and Balance Agency shall perform the following:
 - 1. Adjust each air handler to obtain designed airflow.
- F. Before the work is offered for Final Acceptance, all equipment shall be run through a test to demonstrate that it has been adjusted to meet the requirements of the drawings and Specifications. Copies of the test and adjustment data shall be submitted in a report to the Owner's Representative prior to final inspection.
- G. The TAB Report shall include a General Comments section providing an overview of systems operation, observations of system installation abnormalities and deficiencies, problems encountered, etc. If required, provide explanation of methods of measurement and disparity between measured and design quantities.
- H. Test and Balance Agency Report shall include the following data for each system. All sheets shall be neatly typed. Balancing Agency shall submit with his report a set of neatly marked plans identifying location of each piece of equipment, air terminal, flow measuring device and points of traverse. Report all measured quantities and design quantities where applicable.
 - 1. RPM and CFM of each fan.
 - 2. Supply and return air CFM of each fan terminal unit where required.
 - 3. Air pressure drop across A/C unit cooling coils.
 - 4. Discharge and suction static pressure of each fan.
 - 5. Voltage rating and operating volts of each fan motor. For fan motors requiring three-phase power, record voltage of each individual phased leg and check for voltage imbalance.
 - 6. Nameplate data of each piece of HVAC equipment installed.
- I. During the Final Inspection, the Agency shall have present all necessary instrumentation and an individual to make readings of select information which was submitted in the balance report. The select readings shall be made where directed by and in the presence of the Owner's Representative and shall not deviate more than 5% from the values submitted in the report.
- J. The Owner's Representative may select no more than 20% of all reported data for rechecking. If more than 20% of data verified is not within $\pm 5\%$ of submitted data, the Owner's Representative may void entire report and ask for complete rebalancing. The field check shall be made within 45 days of approved TAB submittal.

END OF SECTION 23 05 93

SECTION 23 07 00 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 23 01 00 "Mechanical General Provisions" apply to this Section.

1.2 SUBMITTALS

- A. Submit manufacturers' data on all insulation products, schedule which indicates where each product is to be used and thickness of each product.

1.3 WARRANTY-GUARANTEES

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATION – GENERAL

- A. All insulation shall have a composite (insulation, jacket or facing and adhesive used to adhere the facing or jacket to the insulation) fire and smoke rating as requested by ASTM E84, NFPA 255 and UL 723, not exceeding:

Flame spread	25
Smoke developed	50

- B. Accessories, such as adhesive, mastics, cements, tapes and fire-resistant cloth for fittings, shall have same fire and smoke ratings as components listed above.
- C. Installation of insulation shall be accomplished in strict accordance with manufacturer's recommendations and shall be ARMACELL for flexible unicellular insulation.

2.2 PIPE INSULATION

- A. Flexible unicellular insulation having a thermal conductivity not greater than 0.27 Btu x in./hr. x sq. ft. x °F in a mean temperature of 75°F.

2.3 DUCT INSULATION

- A. Blanket Type within the conditioned space: Glass fiber, ¾-lbs/cu. ft., foil faced, vapor-sealed flexible duct insulation. Thermal conductivity shall not exceed 0.29 Btu x in./hr. x sq. ft. x °F.

2.4 ACOUSTIC DUCT LINER

- A. Fiberglass duct liner shall not be used.

2.5 ALUMINUM PIPE JACKETS

- A. Aluminum jacket shall be .016" thick (28 ga.) smooth aluminum sized to provide a minimum 2" self-gauging overlap longitudinal and circumferentially, minimum ¾" by .015" thick (30 ga.) draw bands. Jacket shall be supplied with a factory-applied polykraft moisture barrier. CHILDERS PRODUCTS COMPANY, STRAP-ON JACKETING.

- B. Provide fitting covers of same material as jacket and of same manufacturer.

2.6 CALCIUM SILICATE PIPE INSULATION INSERTS

- A. Calcium silicate meeting ASTM C533, Type I, water resistant; rigid molded pipe; asbestos-free JOHNS MANVILLE Thermo-1200, or approved equal.
- B. Thermal conductivity of 0.437 Btu at 300°F mean temperature as tested in accordance with ASTM C335.
- C. Minimum compressive strength of 100 psi to produce 5% compression at 1-1/2" thickness.
- D. Non-combustible as determined by test complying with ASTM E136.
- E. Inserts shall have sufficient compressive strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Insulation inserts shall cover the bottom half of the pipe circumference 180 degrees and be not less in length than the protection shield. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation.

2.7 PVC PIPE JACKET FITTING COVERS

- A. One-piece molded-type PVC plastic fitting covers and jacketing material, color matching JOHNS MANVILLE Zeston 2000, or approved equal.
- B. Connections shall be made using pressure-sensitive color matching vinyl tape.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Insulation shall be installed by a licensed applicator and in strict accordance with the manufacturer's instructions. Deliver all materials to the job site and store in a safe, dry place. Use all means necessary at the job site to protect materials from dust, dirt, moisture and physical abuse before and during installation. Insulation that becomes damaged prior to installation shall not be installed and shall be removed from the job site. Insulation that becomes wet or damaged after installation shall be removed and disposed of and replaced with new insulation.
- B. Surfaces to be insulated shall be cleaned free of dirt, scale, moisture, oil and grease prior to installation of the insulation.

3.2 PIPING

- A. Schedule:

Condensate Drain Above Floor:	1/2" thickness
Refrigerant Suction Piping:	1" thickness flexible unicellular for pipe sizes up to 1-1/2" and 1-1/2" thickness for pipe sizes over 1-1/2".
- B. Fittings and valves on refrigerant suction piping shall be insulated with cut sections of flexible unicellular insulation of thickness equal to adjoining pipe insulation.
- C. All flexible unicellular and glass fiber piping insulation exposed to the weather shall be provided with PVC jacketing.
- D. No piping shall be insulated until it has been tested and thoroughly cleaned.

3.3 DUCTWORK

- A. Definitions:

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SECTION 26 01 00 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE OF WORK

- A. This Section of the Specifications describes the material and installation procedures to be followed for furnishing and installing the electrical equipment and material as outlined and described on the contract drawings and as stated in this Division of the Specifications.
- B. Where the word "Contractor" appears in this Division of the Specifications, it applies to the Contractor performing the electrical portion of the work, unless specifically indicated otherwise.
- C. The Contractor shall install the systems as specified herein and indicated on the contract drawings and shall furnish all labor, material, tools, scaffolds, erection equipment, services and other items of expense as necessary as a part of this Contract. This Contract further includes placing the systems into operation and properly testing, adjusting, balancing and training the owner's personnel on the use of all items of equipment as specified and as approved by the Architect/Engineer

1.3 SUPERVISION

- A. The Electrical Contractor shall have a competent and English speaking designated Supervisor who is a Certified Master Electrician on the job site at all times that any electrical work is being performed. This shall include any and all electrical work being accomplished by contractors who are subcontractors to the prime Electrical Contractor.

1.4 DRAWINGS

- A. General arrangements of the necessary conduits, feeders, light fixtures, devices, panels, and equipment are indicated on the drawings in diagrammatic form only. Due to the scale of the drawings, offsets, fittings, and accessories may not be shown. Work indicated but having details omitted shall be provided complete to an operating condition with all fittings, wiring, and ancillary equipment and material as required. Where rearrangement is necessary, submit drawings of proposed changes for approval and coordinate and arrange work with consideration to the architectural, structural, plumbing, and sprinkler system drawings and to the work of the various other building trades. Equipment provided under this Division of the Specifications shall be installed in accordance with the recommendations of the equipment or material manufacturer.

1.5 COORDINATION

- A. Coordinate the electrical work with the architectural, structural, plumbing, and sprinkler system drawings and work in order to avoid omissions and to eliminate any interference. Report any discrepancies found, as soon as possible, after discovery, to the Architect.
- B. The contractor shall be responsible for coordinating with the Division 23 Contractor for providing properly sized circuit breakers to serve mechanical equipment and motors furnished which differ from that specified or indicated. This shall be further understood to include branch circuit wiring, conduit, disconnect switches, etc., in accordance with the appropriate codes and specifications. The cost of providing this increased electrical service and related work shall be included under the applicable section under which the equipment and motors are being furnished, at no additional cost to Owner.

1.6 CODES AND STANDARDS

- A. Various recognized codes and standards form a part of these Specifications the same as if written fully herein and shall be followed as minimum requirements. The codes and standards will be referred to by their abbreviated names and are listed below. Reference to these standards shall be understood to mean the latest edition and accumulative supplements which have been adopted by the "Authority Having Jurisdiction," unless noted otherwise.

ASAD	ADA Standards for Accessible Design
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IECC	International Energy Conservation Code
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
NEC 2017	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Prevention Association
NFPA 70E	Standard for Electrical Safety in the workplace
OSHA	The Occupational Safety and Health Act
UL	Underwriters Laboratories, Inc.
VUSBC	Virginia Uniform Statewide Building Code, 2018 Edition

- B. All equipment, material, apparatus, and work shall conform to the requirements of the NEC. If the Contractor observes that the drawings and specifications are at variance therewith, the contractor shall notify the Architect in writing. If the Contractor performs such work contrary to the above referenced rules and regulations and without written acknowledgment or notice thereto, they shall correct this work and bear all cost arising therefrom.

1.7 NOTICES AND FEES

- A. Give all required notices, obtain all necessary permits, and pay all required fees, including any fees associated with temporary electrical power services during construction. Utility company fees, which are for the permanent installation of electrical power services, shall be paid for by the Owner.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Refer to Specification 01 33 00 "Submittals" for shop drawing submittal procedures. Submit shop drawings for materials required for this project as indicated herein. Obtain approval from the Architect before manufacture is started on any of same. The shop drawings shall show complete details of the various items, wiring diagrams, etc., and shall be submitted in a sufficient number of copies to allow the Engineer to retain one copy. Approved copies of all shop drawings shall be kept on the job site accessible to the Architect at all times.

2.2 ACCEPTABLE MANUFACTURERS

- A. The following list states specific names of acceptable manufacturers of particular equipment and indicates the types of material on which submittals shall be made:

Submittal
Information
Required:

Light FixturesProduct Data
See light fixture schedule on drawings

NOTE: If substitute light fixtures are submitted for review, provide catalog data on the substitution which will provide all the information required to compare it to the specified product. At a minimum, provide dimensional and weight data, coefficients of utilization (CU) information, and photometrics for both the specified and substitute light fixtures. Provide the same catalog data on the specified fixture also. Submittals that do not include both sets of catalog cuts will be returned marked "Furnish Specified Item".

Disconnect SwitchesProduct Data
General Electric / ABB Company
Square D Company
Eaton/Cutler-Hammer
Siemens

Wiring Devices and Cover PlatesProduct Data
Hubbell
Leviton
Arrow-Hart
Pass and Seymour

Surface Metal RacewayProduct Data
Wiremold
Hubbell Incorporated
Mono Systems

B. The following list states other materials for which product data submittals shall be made:

- Circuit Breakers (each type)
- Conductors (each type)
- Conduit (each type)
- LED Drivers
- LED Lamps
- Occupancy Sensing Switches (all types)
- Surface Metal Raceway (including all accessory components)

C. Catalog numbers and manufacturers are listed as a guide for minimum requirements to be met. Material and equipment of manufacturers other than those listed will be given consideration by the Architect providing the material meets the minimum requirements set forth in these Specifications and providing the material or equipment will provide satisfactory performance for the intended installation, does not exceed the dimensions and weight of the specified item and meets the aesthetic performance desired of the specified item. Submittals of other than specified equipment shall have indicated on the specification sheets in the shop drawing submittals each item called for in these Specifications by paragraph and subparagraph numbers and/or letters.

D. Refer to Specification Section 01 25 00 for substitution requirements.

E. Any deviation from the manufacturers listed in the preceding list and /or of those stated in the Contract Documents shall be submitted to the Architect for approval in accordance with Specification Section 26 05 00, "Materials and Methods." Facsimile transmission of data for review will not be accepted.

- F. The Engineer will review for approval, only one substitute for each type of material specified in the Division 26 Contract Documents. If the substitute material is not approved, the Contractor shall provide the material by one of the specified manufacturers. Approval of substitute material is at the sole discretion of the Architect, and the Contractor shall bear all costs arising therefrom, including any design fees if additional design effort is deemed prudent or necessary by the Architect.
- G. Only the types of materials specified herein are approved for use on this project. No other material types will be considered.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. "Provide," as used on the drawings and in these Specifications, shall mean furnish, install, connect, adjust, test, and place into operation, except where otherwise specifically stated in the contract documents.
- B. Provide coordinated electrical systems, equipment, and material complete with auxiliaries and accessories as required for a complete and operable finished project.
- C. Run all conduits concealed except where specifically indicated otherwise. Exposed conduit installation other than where indicated shall be approved by the Architect prior to installation.

3.2 CLEANING AND PAINTING

- A. Remove all dirt, trash, and oil from all raceways, boxes, fittings, cabinets, and panelboards.
- B. Protect, to the satisfaction of the Architect, all equipment provided against damage during construction. If damage does occur to any materials, refinish, repair, or replace the equipment or material as directed by the Architect.

3.3 REPAIR OF EXISTING WORK

- A. Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:
 - 1. Workmanship: Lay out work in advance.
 - a. Exercise care when cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces as necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings and materials or equipment damaged using skilled craftsmen of the appropriate trades.
 - 2. Existing Concealed Wiring to be Removed:
 - a. Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors and cut conduits flush with concrete floors, and top openings with non-shrink grout. Where wood floors are encountered, remove conduit to below wood floor. Where conduit that passes through walls is removed, seal opening in wall with a material that is equal to the fire rating of the material the wall is constructed from.
 - 3. Continuation of Service:
 - a. Maintain continuity of existing circuits to remain. Existing circuits shall remain energized unless otherwise indicated. Circuits which are to remain but were disturbed during demolition shall have circuit wiring and power restored back to original condition as approved by the Architect. Only materials specified for this project may be used to affect repairs.

3.4 EXCAVATION

- A. All excavations shall be made to the proper depth to assure a firm foundation for the work.

3.5 RECORD DRAWINGS

- A. Refer to Specification Section 01 78 39 "Project Record Documents".

3.6 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Specification Section 01 78 23 "Operation and Maintenance Data".

3.7 EQUIPMENT INVENTORY

- A. Provide a complete equipment inventory for all Electrical Equipment listed below. Refer to Appendix A in this section for the required template. A separate form shall be provided for each new piece of equipment provided.
- B. Prior to substantial completion, submit the equipment inventory forms for review. Once approved, include the forms in the operation and maintenance manual.

The following list states materials for which equipment inventory shall be made:

Light Fixtures

APPENDIX A

New Equipment Inventory

Project Name: **(Add Project Name)**

Project Address: **(Add Project Address)**

Description of Item: _____
(ex. Lighting,)

Classification:

- Lighting
- Power Distribution
- Auxiliary Systems

Building: _____

Equipment Location (Room Number): _____

Date Purchased: _____

Date Placed in Service: _____

Original Cost: _____

Life Expectancy (years): _____

Estimated Replacement Date: _____

Estimated Replacement Cost: _____

Manufacturer: _____

Model/Serial #: _____

END OF SECTION 26 01 00

SECTION 26 05 00 - MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 26 01 00, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Provide all labor, material, tools, scaffolds, erection equipment, services and supplies to fabricate, install, connect, adjust, test, and place in operation the electrical and other systems as called for in these Specifications and as indicated on the Contract Drawings.
- B. Properly store and protect all material and equipment until installed.
- C. All material and equipment shall be new and of the quality noted or specified. Material, equipment, and work of inferior quality will be rejected and shall be removed from the job site immediately upon rejection and replaced. Unacceptable work shall be removed and replaced. All replacement material and work shall be done at the Contractor expense. The Architect will decide upon the quality of material and equipment furnished and of the work performed.

1.3 WARRANTIES

- A. The Contractor shall provide the Owner with a one-year, unlimited material and labor warranty on all work accomplished and materials provided under Division 26 including all components thereof except as otherwise noted herein or in other specifications. The warranty start date is the date of project "Substantial Completion" as determined by the Architect. All warranties shall be submitted as part of the shop drawing submittals.
- B. Electronic LED drivers shall be free from defect in material and workmanship for a period of five (5) years from the date of project "Substantial Completion" as determined by the Architect.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Electrical material furnished under these Specifications shall be new and listed by UL and shall bear the UL label where labeling service is available for the type of material provided for this project.

2.2 RACEWAYS

- A. Raceways shall be of the size indicated or as required by the NEC; whichever is the larger; except where larger conduits are specified on the Contract Drawings. Raceways shall be 1/2" minimum
- B. Raceways shall be provided for all electrical systems indicated on the drawings unless specifically indicated otherwise. Raceways shall be hot-dip galvanized rigid steel conduit (GRS), electrical metallic tubing (EMT), flexible steel conduit, or intermediate metallic conduit (IMC). Flexible steel conduit in kitchen areas shall be liquid tight. Schedule 40 PVC conduit may be used only below grade, under concrete slabs-on-grade and other locations where specifically indicated.

2.3 CONDUCTORS

- A. Conductors shall be of the American Wire Gauge size indicated on the contract drawings or specified herein.
- B. All conductors shall be copper.

2.4 OUTLETS

- A. Outlet and junction boxes shall be of one-piece galvanized construction of a type and size applicable for use in the location indicated on the contract drawings and as required by the NEC.
- B. Locations of outlets for lighting, devices, power, and equipment are indicated on the contract drawings. Owing to the small scale of the drawings, it is not possible to indicate the exact location. Examine the architectural, structural, plumbing drawings, and finish conditions and arrange work as required to meet such conditions to the approval of the Architect/Engineer.
- C. Verify the exact swing of doors and locations of furniture and built-in cabinetry prior to installing outlets for switches and receptacles and make the necessary adjustments in location and mounting height of same to avoid conflicts at no additional cost. Coordinate outlets with change orders, addenda, and job site differences.

2.5 FUSES

- A. All fuses shall be provided by the Electrical Contractor.
- B. Fuses shall be as follows:
 - 1. General: All fuses must carry the UL inspected label. All fuses shall be plainly marked with ampere rating, voltage rating, interrupting capacity when greater than 10,000 Amperes and current limiting where it applies.
 - 2. Interrupting Capacity: Each fuse shall be capable of safely interrupting the maximum short-circuit current available at the point in the circuit where installed.
 - 3. Coordination: Service fuses and the fuses installed in feeder circuits shall be coordinated to provide a selective system of over-current protection.
- C. Main, feeder, and branch circuit fuses shall be as follows:
 - 1. Circuits 0 to 600 amperes shall be protected by BUSSMANN Low-Peak, Limitron, or Fusetron (RK5, 200,000 I/C) Fuses rated as indicated on the drawings.
 - 2. Circuits 601 to 6,000 amperes shall be protected by Type KRP-C HI-CAP current-limiting fuses.
 - 3. Motor Circuits: All motors rated 480 volts or less shall be protected by dual-element fuses rated not in excess of 175% and not less than 125% of motor nameplate rating or as indicated. Larger motors as indicated on drawings where fuse gaps are larger than size required for proper rating of fuse, install "all-metal" fuse reducers.

2.6 LABELING

- A. Label all disconnect switches provided under Division 26 of these Specifications.
- B. Labels shall be machine engraved, laminated, Bakelite, nameplate type. Labels shall have black faces with white letters
- C. Size of labels shall be based on the required lettering and lettering size. The following are the minimum requirements for each type of label:
 - 1. Disconnect switches feeding elevator equipment and cab lights shall be labeled per ANSI/ASME A17.1 and NEC 620-53 in addition to the above.]
- D. Attach labels with a minimum of two rivets or sheet metal screws. Adhesive-backed labeling will not be accepted.

2.7 PULL BOXES

- A. Install pull boxes at all necessary points, whether indicated on the drawings or not, to prevent injury to conductor insulation or other damage that might result from pulling resistance or for other reasons necessary for proper installation. Minimum dimensions shall not be less than the NEC requirements and shall be increased if necessary for practical reasons or where required to fit the job condition.
- B. Above grade pull boxes shall be constructed of galvanized sheet steel, code gauge, except that not less than 12-gauge shall be used for any box. Where boxes are used in connection with exposed conduit, plain covers attached to the box with a suitable number of countersunk flathead machine screws may be used.
- C. All junction and pull box covers shall be labeled indicating the circuits contained therein in a manner that will prevent unintentional interference with circuits during testing and servicing. For example: "HE1-13." See Specification Section 26 05 34 for additional labeling requirements.

2.8 DISCONNECT SWITCHES

- A. Disconnect switches shall conform to governing industry NEMA standards. They shall be listed by UL. Disconnect switches shall be NEMA standard HD, quick-make, quick-break type, and capable of being locked in the off position.
- B. Where disconnect switches are indicated or required by the NEC to be weatherproof, furnish NEMA 3R enclosures. Furnish NEMA 4X enclosures in kitchen areas and other spaces where specifically indicated.
- C. Arc Flash Warning Labels: Provide all disconnect switches provided by this project with Arc Flash warning labels on the exterior of the switch.

2.9 BRANCH CIRCUITS

- A. The branch circuit wiring has been designed to utilize the advantages of multi-wire distribution and shall be installed substantially as indicated on the drawings. Major changes in the grouping or general routing of the branch circuits require prior approval in writing from the Architect/Engineer.
- B. The number of conductors in each run of conduit is indicated on the drawings, but where there is a conflict between the number of wires indicated and the actual number required as determined by the functional requirements of the connected load, or where the number of wires was inadvertently omitted from the drawings, the correct number and size of wires as determined by the functional requirements of the connected load shall govern and be provided at no additional cost.
- C. Where individual 120V or 277V homerun circuits are shown on the drawings, they may be combined as follows:
 - 1. No more than three phase conductors plus three neutrals and one ground per conduit.
 - 2. No two of the same phase conductor per conduit.
 - 3. Provide 120V circuits with individual neutrals per circuit. Neutrals may not be shared.
 - 4. Neutral sharing by 277V circuits is acceptable.

2.10 MOTOR DISCONNECTING MEANS

- A. Provide a disconnecting means for each motor where indicated on the drawings. A circuit breaker in a panelboard or horsepower rated switch will be acceptable as a disconnecting means, if readily accessible and if located within sight of the motor and in compliance with all codes. A quick-make and quick-break general use tumbler or snap switch will be acceptable for capacities of 20 amperes or less and 300 volts and less, provided the ampere rating of the switch is at least double the rating of the equipment controlled. Switches of 30- to 400-ampere

capacity shall be of the enclosed, quick-make and quick-break type, heavy duty, horsepower rated. Switches shall disconnect all ungrounded conductors and shall disconnect grounded conductors if required by the NEC or if called out on the drawings to do so. Switches shall be fusible type where indicated on the drawings.

2.11 CABLE TIES

- A. Provide cable ties in the length required. Standard, indoor cable ties shall be 7.9 inches in length minimum, 0.19 inches in width and 0.47 inches thick. The tensile strength shall be 50 pounds minimum and the maximum bundle diameter shall be 2 inches. Standard cable ties shall be black in color. Plenum rated cable ties shall be 6 inches in length minimum, .075 inches in width and 0.1 inches thick. The tensile strength shall be 50 pounds minimum and the maximum bundle diameter shall be 1.5 inches. Plenum rated cable ties shall be maroon in color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install material in a first-class and workmanlike manner to the satisfaction of the Architect.

END OF SECTION 26 05 00

SECTION 26 05 19 - CONDUCTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 26 01 00, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Feeder and branch circuit wiring shall conform to the requirements of the NEC, and shall meet all relevant ASTM specifications.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer for a complete installation and for the application indicated. Provide copper conductors with a conductivity of not less than 98% at a temperature of 20°C (68°F).
- B. Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by installer to comply with project's installation requirements, the NEC, and NEMA standards. Select from the following UL types those wires with construction features which fulfill project requirements:
 - 1. Type RHH: For dry locations; max operating temperature 90°C (194°F). Insulation, heat-resistant rubber; outer covering, moisture-resistant, flame-retardant, nonmetallic covering; conductor, annealed copper, compressed stranded.
 - 2. Type USE: Underground service entrance cable identified for underground use; max operating temperature 75°C (167°F). Insulation, abrasion, moisture- and heat-resistant, black vulcanized interlinked polyethylene (VIP²); conductor, annealed copper, compressed stranded.
 - 3. Type RHW: For dry and wet locations; max operating temperature 75°C (167°F). Insulation, heat-resistant rubber; outer covering, moisture-resistant, flame-retardant, nonmetallic covering; conductor, annealed copper, compressed stranded.
 - 4. Type THWN or THHN: Max operating temperature not to exceed 90°C (194°F) (THHN) in dry locations, or 75°C (167°F) (THWN) in wet or dry locations. Insulation, flame-retardant, moisture- and heat-resistant, thermoplastic; outer covering, nylon jacket; conductor, annealed copper.
 - 5. Type XHHW: For dry and wet locations; max operating temperature 90°C (194°F) for dry locations, and 75°C (167°F) for wet locations. Insulation, flame-retardant, cross-linked synthetic polymer; conductor, annealed copper.
- C. Service entrance conductors shall be Type XHHW, RHW, or THWN.
- D. Direct buried conductors shall be Type USE.
- E. Unless specified otherwise, power and lighting conductors shall be 600 volt, Type THWN/THHN, or XHHW.
- F. Where light fixtures require 90°C (194°F) conductors, provide only conductors with 90°C (194°F) insulation.

- G. Conductors shall be continuous from outlet to outlet with splices made only in pull boxes, junction boxes, and outlet boxes.
- H. Do not use wire smaller than #12 AWG for power or lighting wiring.
- I. Wiring sizes #12 and #10 AWG shall be solid. Larger sizes may be stranded.
- J. Neutral conductors shall not be under sized.

PART 3 - EXECUTION

3.1 SPLICES

- A. Splicing connectors must have a metal spring that is free to expand. The spring must be suitably coated to resist corrosion. Each connector size must be listed by UL for the intended purpose. The connectors must be suitably color coded to assure that the proper size is used on the wire combinations to be spliced. Each connector must be capable of withstanding 105°C ambient temperatures. The connectors must be compatible with all common rubber and thermoplastic wire insulations. They must also be capable of making copper-to-copper, copper-to-aluminum, and aluminum-to-aluminum splices. At the Contractor's option, self-strapping electrical tap connectors may be used in wire size and voltage range of the connector. When tape is required for splices, SCOTCHBRAND No. 33, or approved equal, shall be used. Use the plastic tape on PVC and its copolymers and rubber-based pressure-sensitive adhesive. The tape must be applicable at temperatures ranging from 0°F through 100°F without loss of physical or electrical properties. The tape must not crack, slip, or flag when exposed to various environments indoor or outdoor. The tape must also be compatible with all synthetic cable insulations as well as cable splicing compounds.
- B. Make splices in conductors #8 AWG and larger with solderless connectors, with molded composition covers.
- C. Connect conductor sizes #12 and #10 AWG with pre-insulated spring connectors rated at not less than 105°C. Connectors shall be UL approved for fixture and pressure work. Connectors shall be 3M CO. SCOTCHLOK, Type Y, R, and B, or approved equal.
- D. Join or terminate conductors #8 AWG and larger with pressure-type copper connectors and properly tape.
- E. All branch circuit, feeder, and control wiring shall be color coded. The color shall be integral with sheath for sizes #12, #10, and #8 AWG. Larger size wire and cable shall be color coded with a minimum 1/2" wide, colored, plastic tape strip. Place strips a minimum of 6" on center anywhere the conductors are accessible and visible. Wire and cable shall be color coded to match the existing color coding if an existing color code is present. If there is no existing color code, provide the following:

<u>120/208-Volt System</u>	<u>277/480-Volt System</u>
Phase A - black	Phase A - brown
Phase B - red	Phase B - orange
Phase C - blue	Phase C - yellow
Neutral - white	Neutral - gray
Ground - green	Ground - green

- F. After all wiring is pulled and ready for operation but prior to placing systems in service, conduct insulation resistance tests in all feeder circuits. Measure the insulation resistance between conductors and between each conductor and ground. Make measurements with an instrument capable of making measurements at an applied potential of 500 Volts.
- G. Take readings after the voltage has been applied for a minimum of one minute. The minimum insulation resistance for circuits of #12 AWG conductors shall be 1,000,000 ohms. For circuits

of #10 AWG or larger conductor, a resistance based on the allowable ampacity of the conductor shall be as follows:

25 through 50 Amperes	250,000 ohms
51 through 100 Amperes	100,000 ohms
101 through 200 Amperes	50,000 ohms
201 through 400 Amperes	25,000 ohms
401 through 800 Amperes	12,000 ohms
Over 800 Amperes	5,000 ohms

- H. Advise the Engineer if the color-coding provided by the utility company differs from that indicated above.

3.2 TEMPORARY WIRING

- A. Temporary wiring is not specified nor governed by this Division of the Specifications.

END OF SECTION 26 05 19

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SECTION 260526 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 26 01 00, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Provide grounding for conduits, motor frames, metal casings, receptacles, and solid neutral, and as required by NEC Article 250.

PART 2 - PRODUCTS

2.1 GROUND WIRE

- A. Provide a green insulated ground wire, sized per the NEC, in all conduits, junction boxes, and pull boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Connect grounding conductors to the panelboard equipment ground bus and not to the panelboard neutral bus. Also connect grounding bushings to the ground bus. Connect the neutral bus only to the system neutral wire. Provide a bonding wire between the equipment ground bus and the neutral bus in the main distribution equipment only. The grounding system (conduit, cabinets, enclosures, and grounding conductors) and the grounded system (neutral conductors and service equipment ground) shall be separate and independent systems, except at the main distribution equipment.
- B. Test resistance to ground and submit readings to the Architect for review. Include the date and time of the test and the name of the individual performing the test.

END OF SECTION 26 05 26

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SECTION 26 05 33 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 26 01 00, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Run all conduit concealed, except conduit may be run exposed in mechanical rooms, locations where specifically indicated, and spaces with exposed construction as approved by the Architect.
- B. Provide a conduit system complete with fittings and hangers as specified herein and as required by the NEC. Run all electrical wiring systems above 24 Volts in conduit unless specifically indicated otherwise.
- C. Install conduit as a complete system without wiring and continuous from outlet to outlet and from fitting to fitting, mechanically and electrically connected to all boxes, fittings, and wireways, and grounded in accordance with the NEC.
- D. Cap ends of all conduit promptly upon installation with plastic pipe caps. Caps shall remain until wiring is ready to be installed. Taping the ends of conduits is not acceptable.
- E. Size conduit to equal or exceed the minimum requirements of the NEC (except where sizes are specifically indicated on the drawings and in these specifications).
- F. Verify exact swing of doors, prior to installing conduit for switches. Coordinate switches with the Architect's plans, change orders, addenda, and job site differences and make the necessary adjustments to avoid conflicts at no additional cost.
- G. Coordinate the routing of conduit with other trades to avoid conflicts with structural members, piping, ductwork, and other job site conditions.
- H. When PVC conduit is used below grade, it shall be glued together in such a manner so as to make it watertight.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Minimum size conduit shall be 1/2" unless noted or indicated otherwise on drawings. Use larger sizes as required by the NEC to accommodate the number and sizes of wires contained therein.
- B. Conduit concealed in walls or above ceilings shall be rigid (GRS), electrical metallic tubing (EMT), or intermediate metallic conduit (IMC). Flexible conduit may be used above accessible ceilings only. Conduit installed below grade and under concrete floors and slabs shall be Schedule 40 PVC, unless otherwise indicated. Conduit run vertically through concrete shall be GRS or IMC starting at 6" below the bottom of the slab. Where conduits turn up inside a wall cavity, IMC and GRS may be converted to EMT at 6" above the top of the concrete slab.
- C. GRS, EMT and IMC shall be UL approved, hot-dip, high-strength, galvanized steel.
- D. Rigid PVC conduit shall be Schedule 40 (or Schedule 80 if required by the NEC), extruded from high-grade PVC compound and shall be light gray in color. Rigid PVC conduit shall be UL approved for direct burial and concrete encasement.

- E. Flexible conduit shall be galvanized, continuous spiral, single strip type. In areas subject to moisture, and where specifically indicated, flexible conduit shall have a plastic covering in accordance with NEC Article 350. Fittings shall be standard UL approved with ground connector. Watertight connectors shall be used with plastic-covered conduit. All flexible conduit installed in kitchens shall be plastic covered. The maximum length for flexible conduit is 72" unless as otherwise indicated.
- F. Conduit may not be run in the flutes of metal roof decking and may not be attached to any part of metal roof decking.
- G. Bury conduit run below grade a minimum of 24" below finished grade or so the top of the conduit is 6" below the bottom of the concrete slab if run underneath concrete unless indicated or required to be deeper. Increase the burial depth as required so that no part of the conduit radius is within the concrete slab where conduits turn vertical. Coordinate conduit routings and depths with all other trades and any and all existing underground utilities.
- H. Empty or spare conduits stub-ups shall be capped with a threaded cap.
- I. In areas classified as hazardous, the conduit coupling shall be below concrete slab and a single section of GRS conduit may be installed up to 18" A.F.F. to accept the required seal fitting.

2.2 FITTINGS

- A. All conduit entering or leaving panelboards, cabinets, outlet boxes, pull boxes, or junction boxes shall have lock nuts and bushings, except provide insulated throat connectors on EMT conduit 3/4" and 1". Rigid steel conduit shall have a lock nut both inside and outside of the enclosure entered. Install bushings on the ends of IMC conduit and EMT conduit larger than 1". Insulating bushings shall be OZ Type A for GRS and IMC, and Type B for EMT. Conduit entering enclosures through concentric knockouts shall have grounding-type bushings with copper bond wire to enclosure.
- B. Provide expansion fittings where conduits cross building expansion joints. Expansion fittings shall be OZ Type AX with OZ Type BJ bonding jumper. See Architectural drawings for location of expansion joints.
- C. Fittings for rigid conduit shall be threaded type, except where IMC changes to EMT above floor slab, fittings shall be threadless type.
- D. Fittings for EMT shall be UL-approved, steel set screw couplings.
- E. Conduits entering service enclosures (panelboards, disconnect switches, switchboards, motor control centers, etc. used as service entrance equipment) shall be provided with specification grade, insulating, grounding type bushings. Grounding bushing shall be bonded together and bonded to the service grounding buss.

2.3 JUNCTION BOXES

- A. Use junction boxes on exposed conduit work for changes in direction of conduit runs and breaking around beams and columns.
- B. Furnish covers and gaskets with the junction boxes where installed in damp or wet locations.
- C. Label all junction and pull box covers indicating the circuits contained therein in a manner that will prevent unintentional interference with circuits during testing and servicing. For example: "HE1-13." See Specification Section 26 05 34 for labeling requirements.

2.4 PIPE SLEEVES

- A. Provide pipe sleeves where conduits larger than 2" pass through walls. Contractor shall be responsible for proper and permanent location. Conduit shall not be permitted to pass through footings, beams, or ribs, unless indicated and/or approved. Coordinate pipe sleeve locations with all other trades affected.

- B. Install pipe sleeves and properly secure in place with grout where conduit passes through masonry or concrete and at all fire-rated assemblies. Pipe sleeves shall be of a sufficient diameter to provide approximately 1/4" clearance all around the conduit. Fill void between conduit and sleeve with mineral wool to prevent sound transmission. Pipe sleeves in foundation walls shall be cast iron, 2" larger in diameter than the conduit installed. Pipe sleeves in walls, floors, and partitions shall be Schedule 40 black steel pipe. Extend sleeves above floor at least 1", pack space around conduit with fireproof material, and make watertight. Pipe sleeves passing through firewalls, smoke partitions, fire partitions, or floors shall be sealed with a UL-rated system appropriate for the specified rating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install conduit concealed in walls, below floor slabs, and above ceilings, except conduit may be run exposed in mechanical and electrical equipment rooms. Maintain a minimum clear distance of 6" from parallel runs of flues, steam, or hot water pipes. Do not run conduit horizontally in concrete slabs.
- B. Use flexible conduit (minimum 18" in length, maximum 72" in length) for connections to all motors, dry-type transformers, water heaters, and any equipment subject to vibration.
- C. Group conduit so it is uniformly spaced, where straight and at turns. Make bends and offsets (where unavoidable) with a hickey or bending machine.
- D. Ream GRS and IMC conduit after threading to remove all burrs.
- E. Securely fasten conduit to outlets, junction boxes, and pull boxes to affect firm electrical contact. Join conduit with approved couplings. Running threads are not allowed.
- F. Exercise care to avoid condensation pockets in the installations. Keep conduit, fittings, and boxes free from foreign matter of any kind, before, during, and after installation.
- G. Do not use EMT below grade, outdoors and in wet locations.
- H. Support exposed runs of conduit in accordance with N.E.C. 342, 344, 348, 350 and 358 and parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings with right angle turns consisting of fittings or symmetrical bends. Support conduit within one foot of all changes in direction and on each side of the change.
- I. Supports shall be wall brackets, trapeze, strap hanger, or pipe straps, secured to hollow masonry with toggle bolts; to brick and concrete with expansion bolts; to metal surfaces with machine screws; and to wood with wood screws.
- J. Use explosive drive equipment to make connections where the use of this equipment is beneficial, and is subject to strict compliance with safety regulations and approved by the Owner.
- K. Wooden plugs inserted in masonry and the use of nails as fastening media are prohibited.
- L. Do not support conduit from lay in tile ceilings grids, ceiling grid hangers, or lay on ceiling tiles.
- M. Prime conduit with a surface conditioner "GalvaGrip" or approved equal and paint to match the surface on which attached. Conduit installed in mechanical and electrical rooms need not be painted.
- N. Install and support conduit from the underside of the upper chord in bar joist construction.
- O. Do not support conduit from or attach outlet or junction boxes to metal roof decks.
- P. Do not run conduit in the cavity of exterior walls between brick and CMU.
- Q. Seal openings in floors where conduits penetrate vertically through with a clear silicon sealant to prevent liquids and insects from passing through.

- R. Where conduits penetrate vertically through fire-rated floors, or walls seal the conduits with a UL-Listed, water-resistant firestop material with a rating equal to or greater than the rating of the penetrated floors.
- S. Metal conduit installed in earth shall be painted with two coats of bitumastic paint.
- T. All conduit runs entering the building from outdoors shall be sealed against moisture migration and condensation by filling with insulating type foam.

END OF SECTION 26 05 33

SECTION 26 05 34 - ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 26 01 00, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Furnish and install all junction boxes of a type and size applicable for use in the location indicated on the drawings and where required by the NEC.
- B. Exercise special care in the location of outlet and junction boxes in order that the hanging or recessing of light fixtures will not be obstructed by piping or ductwork installed by other trades. To this end, coordinate the work with representatives of the other trades involved and by reference to the architectural, structural, plumbing and sprinkler drawings.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Outlet boxes shall be sheet steel, zinc coated, or cadmium plated.
- B. Provide existing and new outlet boxes installed but not used, including data outlets, with blank coverplates matching those provided on adjacent outlets.
- C. Size boxes as follows:
 - 1. Switch and Receptacle Outlet Boxes: Provide single gang outlet boxes 1-1/2" deep unless required to be larger. Provide extra deep boxes where required.
 - 2. Fixture Outlets in Ceiling: 4" octagonal, minimum. Where required to accommodate larger conduit or a larger number of wires: 4-11/16" by 2-1/8" deep.
 - 3. One-piece multi-gang boxes for use where two or more switches or receptacles are located side by side: 2-1/8" deep. Sectionalized boxes will not be allowed.
 - 4. Where larger size boxes are required or called for, they shall be similar in all other respects to the types specified above.
- D. Light fixture outlet boxes, where fixtures are to be mounted on the box, shall have suitable studs and supports for carrying the weight of the fixture. Increase box depth, as required, for additional wires and conduits.
- E. Boxes in new finished walls shall be flush mounted and have flush coverplates and proper type extension rings or plaster covers where required. Provide blank Series 302 stainless-steel coverplates on boxes not scheduled to receive coverplates of an otherwise specified type.
- F. Provide boxes located above suspended ceilings with galvanized steel covers, with openings or knockouts as required for type of service.
- G. Boxes installed in concrete construction shall be galvanized concrete type at all locations except where conduit or cast-iron boxes are required for watertight or vaportight outlets.
- H. Boxes installed in the floor shall be as specified on the drawings and shall comply with the requirements indicated on the drawings. Provide brass carpet flanges where boxes are installed in carpeted areas.

2.2 PULL BOXES AND JUNCTION BOXES

- A. Install pull boxes and junction boxes where required for changes in direction, at junction points, and where needed to facilitate wire pulling.
- B. Size boxes in accordance with the requirements of the NEC.
- C. Boxes shall be constructed of 12-gauge minimum hot-rolled sheet steel and shall be hot-dip galvanized inside and outside to match the conduit. Boxes shall have removable covers.
- D. Label the front face of the cover on each box with indelible black marker indicating the number of each circuit contained in or running through the box. In areas where exposed construction is the final finished condition and conduit and junction boxes are called out to be painted, label the inside face of the covers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Check all door swings and coordinate with all furniture, built-in equipment, and cabinetry prior to roughing-in conduit and boxes for switches, receptacles, and auxiliary system devices. Make necessary adjustments in the location of same to avoid conflicts as approved by the Architect and at no additional cost to the Owner.
- B. Install all outlet boxes flush with wall or ceiling finish.
- C. Mounting heights of outlets in tile or unplastered masonry shall be varied plus or minus to the nearest block joint so the bottom or top of the box rests on a block joint. Install outlet boxes in the same space at the same height above finished floor unless indicated or required to be otherwise.
- D. Check the location of all wall outlets prior to roughing-in conduit to verify that the outlet will clear any wall fixtures, shelving, work tables, etc., that exist or will be installed. Make necessary adjustments in the location of wall outlets to avoid conflicts as approved by the Architect and at no additional cost to the Owner.
- E. Prior to roughing-in conduit, coordinate with other trades and the Owner regarding all equipment requiring electrical connections. Required adjustments to the conduit and wire sizes shall be made at no additional cost.
- F. Conduit installation shall be rigid and secure, and, where necessary, angle iron (1" by 1" by 1/4" or larger) shall be provided to facilitate adequate mounting.
- G. Install electrical boxes and fittings in accordance with manufacturer's published instructions, applicable requirements of the NEC and NECA "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.
- H. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
- I. Provide "weatherproof-while-in-use" rated outlet covers for interior and exterior locations exposed to weather or moisture.
- J. Provide knockout closures to cap unused knockout holes where blanks have been removed in panel cans, terminal cabinet backboxes, junction boxes, outlet boxes and pull boxes.
- K. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
- L. Do not install boxes back to back in walls. Provide not less than 6" (150 mm) separation. Thru-the-wall boxes may not be used.
- M. Position recessed outlet boxes accurately to allow for surface finish thickness.
- N. Set floor boxes level and flush with finish flooring material.

- O. Fasten electrical boxes firmly and rigidly to substrates or structural surfaces to which attached or solidly embed electrical boxes in concrete or masonry.
- P. Subsequent to installation of boxes, protect boxes from construction debris and damage.
- Q. Upon completion of installation work, properly ground all electrical boxes.
- R. Do not mount boxes to metal roof decking.

END OF SECTION 26 05 34

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SECTION 26 27 26 - WIRING DEVICES AND DEVICE PLATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 26 01 00, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of the electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this Section include the following:
 - Receptacles
 - Ground-fault circuit interrupters
 - Switches
 - Cover plates
 - Wall Plate-type Dimmer Switches
 - Plugs and Connectors
 - Floor Service Outlets
- C. Comply with the requirements of the NEC, as applicable to installation and wiring of electrical wiring devices.
- D. Comply with applicable requirements of UL 20, 486A, 498, 943, and 1472 pertaining to installation of wiring devices. Provide wiring devices which are UL-Listed and labeled.
- E. Comply with applicable portions of NEMA WD1, "General-purpose Wiring Devices, and WD5, "Wiring Devices, Specific Purposes."

PART 2 - PRODUCTS

2.1 FABRICATED WIRING DEVICES

- A. Provide factory-fabricated wiring devices in types and electrical ratings for applications indicated and which comply with NEMA WD1. Provide ivory colored-devices, except as otherwise indicated.

2.2 RECEPTACLES

- A. Duplex: Provide Industrial/Institutional, Specification-Grade, duplex receptacles, 2-pole, 3-wire, grounding, with green hexagonal equipment ground screw, single-piece brass mounting yoke with integral ground terminals, 20 amperes, 125 Volts, with metal plaster ears; designed for side and back wiring, with NEMA configuration 5-20R, unless otherwise indicated. LEVITON 5362, Series, or approved equal.
- B. Ground-fault Circuit Interrupters: Provide Industrial/Institutional, Specification-Grade, "feed-thru"-type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20 amperes, 120 Volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 mA ground-fault trip level; equipped with NEMA configuration 5-20R. LEVITON model 7899, Series, or approved equal.

- C. Combination Duplex receptacle with one Type A and one Type C USB Chargers, Tamper Resistant; Provide Combination Duplex Receptacle/Outlet and USB Charger, 20 Amp, 125 Volt, Decora Tamper-Resistant Receptacle/Outlet, Self-Grounding, NEMA 5-20R with one Type A and one Type C USB Chargers, LEVITON model T5833 or approved equal.

2.3 SWITCHES

- A. Snap: Provide Specification-Grade, flush, single-pole toggle switches, 20 amperes, 120/277 Volts AC, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, equipment grounding screw, and side-wired screw terminals. LEVITON 1221-2 Series, or approved equal. Provide for key operation where indicated on drawings.
- B. Three Way: Provide Specification-Grade, flush, 3-way switches, 20 amperes, 120/277 Volts AC, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, equipment grounding screw, side-wired screw terminals, with break-off tab features, which allow wiring with separate or common feed. LEVITON 1223-2 Series, or approved equal. Provide for key operation where indicated on drawings.
- C. Four Way: Provide Specification-Grade, flush, 4-way quiet switches, 20 amperes, 120/277 Volts AC, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, equipment grounding screw, side-wired screw terminals, with break-off tab features, which allow wiring with separate or common feed. LEVITON 1224-2 Series, or approved equal. Provide for key operation where indicated on drawings.
- D. LED Dimmers: Provide 120/277 volts AC, 60Hz, Single pole and 3-Way, 0-10VDC, LED power Supply Dimmer controls for LED light fixtures; wattage as indicated, with continuously adjustable slide dimmer, ON/OFF button, and equipped with electromagnetic filters to eliminate noise, RF and TV interference.
- E. Provide key-operated switches where indicated on the plans. LEVITON 1221-2 Series, or approved equal.

2.4 WIRING DEVICE ACCESSORIES

- A. Cover plates: Provide mid-size stainless steel cover plates for single and combination wiring devices of types and with ganging and cutouts as required. Provide metal screws for securing plates to devices; screw heads colored to match color of plates. Provide stainless-steel cover plates in mechanical and electrical equipment rooms.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES

- A. Install wiring devices where indicated in Contract Documents in accordance with manufacturer's published instructions, applicable requirements of the NEC and NECA "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.
- C. Install wiring devices only in electrical boxes which are clean, free from building materials, dirt, and debris.
- D. Install wiring devices after wiring work is completed.
- E. Install cover plates after painting work is completed. Label the inside face of each cover plate with indelible black marker indicating the number of each circuit contained in or running through the outlet box.

- F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B. Use properly scaled torque indicating hand tool.
- G. Terminate all switch and receptacle wiring on side screw terminals. Back terminations are not permitted.
- H. Install all switches and receptacles with sufficient wiring length such that the device may be extracted from the outlet box a minimum of 6" while still connected.

3.2 PROTECTION OF COVER PLATES AND RECEPTACLES

- A. Upon installation of cover plates and receptacles, take caution regarding use of convenience outlets. At time of Substantial Completion, replace all cover plates and receptacles which have been damaged; during the execution of this project; including those painted over, burned, or scored by faulty plugs.

3.3 GROUNDING

- A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounding.

3.4 TESTING

- A. Prior to energizing circuitry, test wiring for electrical continuity and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements.

END OF SECTION 26 27 26

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SECTION 26 51 00 - INTERIOR BUILDING LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 26 01 00, "Electrical General Provisions," apply to this Section.

1.2 DEFINITIONS

BF:	Driver factor.
CCT:	Correlated color temperature
THD:	Total Harmonic Distortion
CRI:	Color-rendering index.
CU:	Coefficient of utilization.
RCR:	Room cavity ratio.
L70:	Minimum 70% maintained initial-rated lumens at average rated life for LEDs.
IESNA:	Illuminating Engineering Society of North America
LM-80:	IESNA approved method of measuring Lumen Depreciation of LED Light Sources
LED:	Light Emitting Diode
UL:	Underwriter Laboratories

1.3 SCOPE OF WORK

- A. Extent of interior light fixture work is indicated by drawings and schedules.
- B. Light fixtures shown installed on exterior walls or under canopies attached to the building are considered interior building lighting.
- C. Types of interior light fixtures in this Section include the following:
Light-emitting Diode

1.4 QUALITY ASSURANCE

- A. Comply with the requirements of the NEC, as applicable to installation and construction of interior building light fixtures.
- B. Provide interior light fixtures which are UL-Listed and labeled.
- C. Provide LED drivers which comply with NEMA SSL-1, "Electronic Drivers for LED Devices, Arrays, or Systems", and SSL-3, "High Power White LED Binning for General Illumination".

PART 2 - PRODUCTS

2.1 INTERIOR LIGHT FIXTURES

- A. Provide light fixtures of sizes, types, and ratings indicated; complete with, but not limited to, housings, reflectors, LED module, LED drivers and wiring. Provide fixture trims as required for proper installation into the type ceiling in which installed. Review Architectural reflected ceiling plans for ceiling types and construction and provide all mounting hardware required for proper installation of the fixtures specified for the location.
- B. Air-Handling Fixtures: Fixtures used as air-handling registers shall meet requirements of NFPA.

2.2 LED LIGHT FIXTURES

- A. LED fixtures shall be in compliance with UL.
- B. Interior Area LED Fixtures:
 - 1. Kelvin temperature of interior fixtures as indicated on drawings.
 - 2. Minimum of 75 plus lumens per watt.
 - 3. CRI 80 or greater.
 - 4. 5-year warranty minimum with L70 of 50,000 hours or greater.
 - 5. Modular design for field replacement of parts.
 - 6. Tool less access to driver and LED modules.
 - 7. Cannot have LED pixilation (or commonly called bug eye effect).
 - 8. UL certified up to 90F degrees operating temperature.
- C. Manufactured by one of the following:
 - 1. Nichia Corporation.
 - 2. Cree, Inc.
 - 3. Philips LumiLED.
 - 4. Osram Opto Semiconductors.
 - 5. Cooper Industries.
 - 6. Lusio Lighting.
 - 7. Sony.
 - 8. Citizens Electronics

2.3 RECESS- AND FLUSH-MOUNTED FIXTURES

- A. Provide light fixture types which can be relamped from the bottom. Access to driver shall be from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as required for the ceiling construction in which it is installed.

2.4 SUSPENDED FIXTURES

- A. Provide hangers capable of supporting twice the weight of the fixture supported by the hanger. Provide with swivel hangers to ensure a plumb installation. Hangers shall be cadmium-plated steel with a swivel-ball tapped for the conduit size required. Hangers shall be shock-absorbing type where indicated. Hangers shall allow fixtures to swing within an angle of 20 degrees. Multiple-unit or continuous row fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end, unless indicated otherwise. Rods shall be a minimum .18" diameter.

2.5 EXIT LIGHTS

- A. Exit lights shall be in conformance with UL and NFPA. Exit lights shall be self-powered type where indicated.
- B. Self-Powered LED-Type Exit lights (Battery Backup): Provide with automatic power failure device, test switch, pilot light and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed electrolyte type, shall operate unattended, and require no maintenance, including no additional water, for a period of not less than 5 years. LED exit lights shall have emergency run time of 1.5 hours (90 minutes) minimum.

2.6 EMERGENCY LIGHTING EQUIPMENT

- A. Equipment shall be in conformance with UL and NFPA. Provide lamps in wattage indicated.
- B. LED Emergency Driver: Each unit shall consist of an automatic power failure device, test switch operable from outside of the fixture, pilot light visible from outside the fixture, and fully automatic solid-state charger in a self-contained power pack. Charger shall be either trickle, float, constant-current or constant-potential type, or a combination of these. Battery shall be sealed electrolyte type with capacity as required to supply power to two LED circuit boards for

90 minutes at a minimum of 800 lumens output power. Battery shall operate unattended and require no maintenance for a period of not less than 5 years.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install interior light fixtures at locations and heights as indicated in accordance with fixture manufacturer's published instructions, applicable requirements of the NEC, NECA "Standard of Installation," NEMA standards, and with recognized industry practices to ensure that light fixtures fulfill requirements.
- B. Coordinate with all other work on this Contract as appropriate to properly interface installation of interior light fixtures.
- C. Fasten fixtures securely to building structural members, and check to ensure that solid pendant fixtures are plumb. Recessed fixtures shall be supported with individual annealed, light zinc-coated finish, 12-gauge wire from all four corners tied to building structural members. Securing safety wires to bridging is not acceptable. The supporting wires shall be distinguishable by color or tagging.
- D. Clean interior light fixtures of dirt and debris (including lenses) upon completion of installation.
- E. Protect installed fixtures from damage during entire construction period.

3.2 FIELD QUALITY CONTROL

- A. Upon completion of installation of interior light fixtures and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- B. At the time of Substantial Completion, replace lamps in interior light fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by the Architect.

3.3 GROUNDING

- A. Provide tight equipment grounding connections for each interior light fixture installation.

END OF SECTION 26 51 00

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SECTION 27 53 16 - ELEVATOR EMERGENCY TWO-WAY COMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 26 01 00, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Provide and install a complete and fully operational Emergency Communication System as specified herein and indicated on the drawings. The system shall provide both visual and audible indications of persons in distress as well as voice communications to the specified areas. Refer IBC section 1007.8.
 - 1. The system shall be a vandal-resistant system providing two-way communications between all emergency two-way communication and the master station throughout the building.
 - 2. Station shall be fabricated from #16 AWG stainless steel and shall have engraved lettering. Stamped lettering shall not be permitted.
 - 3. Station and signage shall also be provided with lettering in Braille.
 - 4. Station shall be provided with a stainless-steel and fastened with tamper-proof hardware. Station shall be equipped with a 3" x 3" help button and a light to indicate that help is on the way. A second light shall illuminate to indicate that the system is in operation.
- B. The work indicated in this Section shall be provided complete, suitable for its intended use, and shall be fully incorporated into the work.
- C. The provisions of the Contract Documents apply to the work of this Section, and shall be carefully examined, for their applicability to this Section, to ensure a complete installation.
- D. Provide this work in accordance with the Contract Documents, NFPA 70-NEC (1996), (and the pertinent sections of the other references), and the manufacturer's requirements and recommendations. Conflicts shall be as determined by the Architect/Engineer.
- E. All accessories required or recommended by the references or the manufacturer shall be provided.

1.3 SUBMITTALS

- A. Submittals concerning the work of this Section are only required as stipulated within this Section. Extraneous submittals will be returned with no action.
- B. Required Submittals:
 - 1. Product Data on Equipment.
 - 2. Product Data on Operating Instructions Signage.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Amplifier: The Amplifier shall provide control amplification and power circuits for system operation. The unit shall be housed in a rugged extruded steel case and shall have integrated circuit amplification. The call tone shall be an integrated circuit with oscillator amplification at 400 Hz. The Amplifier shall be driven from 16-volt transformer.
- B. Master Station: The Master Station shall be provided with one indication light and selector switch for the Emergency Communication System connected. The unit shall incorporate

Talk/Listen switches for control of all voice conversations. When the Talk/Listen switch is used, an indicator light shall illuminate on the area station indicating that help is on the way. The master station shall have a timed automatic telephone dial-out capability to a monitoring location or 911.

- C. Area Station: The Area Station shall be installed as indicated on the drawings. Each station shall be flush mounted. The Area Station shall be provided with a 3" x 3" help button, label reading "Emergency Communication System – Push for Help," and two (2) indication lights. The units shall provide audible and visual indication of persons in distress at the Master Station. Two-way voice communications shall be established from the Master Station allowing response from the Area Station to be hands free.
- D. Instructions on using the Emergency Communication System in an emergency shall be posted next to the two-way communication system.
- E. Signage for both the help button label and the instructions for use shall comply with the following:
 - 1. Character Proportion: Letters and numbers on signs shall have a width-to-height ratio between 1:5 and 1:10.
 - 2. Color Contract: Characteristics and symbols shall contrast with the background – either light characters on a dark background or dark characters on a light background.
 - 3. Characters or symbols: Letters, numbers, symbols, or pictographs on signs shall be raised or incised 1/32" minimum and shall be sans serif characters. Raised characters shall be at least 5/8" high, but no higher than 2".
 - 4. Mounting Height: The top of the posted instructions shall be no more than 54" above the finished floor.
 - 5. Provide grade 2 Braille lettering in addition to text.

PART 3 - EXECUTION

3.1 EXECUTION

- A. Perform this work in accordance with acknowledged industry and professional standards and practices, and the procedures specified herein.
 - 1. Provide and install all material, devices, components, and equipment for complete operational systems.
 - 2. Maintain a competent supervisor and supporting technical personnel, acceptable to the Owner, during the entire installation. Change of the supervisor during the project shall not be acceptable without prior written approval from the Architect/Engineer.
 - 3. Coordinate all efforts with those of related trades. In the event of any conflicts, delayed or important preparatory work by others, notify the Owner or the Owner's agent; the Owner's or Owner's agent's decision shall be binding.
 - 4. All wiring shall be installed in conduit. Provide pull wire in all empty conduit.
 - 5. The Contractor shall be responsible for reviewing and coordinating conduit installation for the system with the Division 26 Contractor.
 - 6. Connect the control panel to a separate dedicated branch circuit, maximum 20 amperes. The circuit breaker serving the control panel shall be provided with Red color lockout device.

END OF SECTION 27 53 16