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NOT APPLICABLE

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SECTION 00 72 00

GENERAL CONDITIONS

The General Conditions of the Contract for Construction (AIA Document A201, Sixteenth Edition, 2007), hereinafter referred to as the "General Conditions" are hereby made part of the Contract Documents to the same extent as if reproduced in full, except as modified, amended, revised, rescinded, or supplemented by the Owner and Contractor Agreement (the "Contract"), which shall take precedence in all cases of conflicting requirements. Those portions of the AIA General Conditions, which are not altered, modified, amended, rescinded, or otherwise acknowledged or addressed by the Owner and Contractor Agreement shall remain in full force and effect as published.

Copies of the Sixteenth Edition of AIA Document A201 may be examined at the offices of the Architect or may be purchased, at a nominal charge, from any dealer in Architect's supplies, from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C. 20006, or from AIA Dallas, 1909 Woodall Rodgers Freeway, Suite 100, Dallas, Texas 75201 (214-742-3242).

END OF DOCUMENT

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SECTION 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Include in contract sum allowances stated in Contract Documents.
 2. Designate in construction progress schedule delivery dates for Products specified under each allowance.
 3. Designate in Schedule of Values quantities of materials required under each unit cost allowance.

1.2 ALLOWANCES FOR PRODUCTS

- A. Amount of Each Allowance Includes:
1. Cost of Product to Contractor or subcontractor, less applicable trade discounts.
 2. Delivery to site.
 3. Labor required under allowance, except when labor is specified to not be included in allowance.
 4. Applicable taxes.
- B. In addition to amount of each allowance, include in contract sum Contractor's costs for:
1. Handling at site, including unloading, uncrating, and storage.
 2. Protection from elements and from damage.
 3. Labor for installation and finishing where labor is specified to not be a part of allowance.
 4. Other expenses required to complete installation.
 5. Contractor's and Subcontractor's overhead and profit.

1.3 SELECTION OF PRODUCTS UNDER ALLOWANCES

- A. Architect's Duties:
1. Consult with Contractor in consideration of Products and suppliers or installers.
 2. Make selection in consultation with Owner. Obtain Owner's written decision, designating:
 - a. Product, model and finish.
 - b. Accessories and attachments.
 - c. Supplier and installer as applicable.
 - d. Cost to Contractor, delivered to site or installed, as applicable.
 - e. Manufacturer's Warranties.
 3. Transmit Owner's decision to Contractor.
 4. Prepare Change Orders.

- B. Contractor's Duties:
 - 1. Assist Architect and Owner in determining qualified suppliers or installers.
 - 2. Obtain proposals from suppliers and installers when requested by Architect.
 - 3. Make appropriate recommendations for consideration of Architect.
 - 4. Notify Architect promptly of:
 - a. Reasonable objections Contractor may have against supplier, or party under consideration for installation.
 - b. Effect on Construction Schedule anticipated by selections under consideration.

1.4 CONTRACTOR RESPONSIBILITY FOR PURCHASE, DELIVERY AND INSTALLATION

- A. On notification of selection, execute purchase agreement with designated supplier.
- B. Arrange for and process Shop Drawings, Product Data and Samples, as required.
- C. Make arrangements for delivery.
- D. Upon delivery, promptly inspect products for damage or defects.
- E. Submit claims for transportation damage.
- F. Install and finish products in compliance with requirements of referenced specification sections.

1.5 ADJUSTMENT OF COSTS

- A. Should net cost be more or less than specified amount of allowance, contract sum will be adjusted accordingly by Change Order.
 - 1. Amount of Change Order will recognize changes in handling costs at site, labor, installation costs, overhead, profit, and other expenses caused by selection under allowance.
 - 2. For products specified under unit cost allowance, unit cost shall apply to quantity listed in Schedule of Values.
 - 3. For products specified under unit allowance, unit cost allowance shall apply to quantities actually used with nominal amount for waste, as determined by receipts, invoices or by field measurement.
- B. Submit claims for anticipated additional costs at site, or other expenses caused by selection under allowance, prior to execution of work.
- C. Submit documentation for actual additional costs at site, or other expenses caused by selection under allowance within 60 days after completion of execution of Work.
- D. Failure to submit claims within designated time will constitute waiver of claims for additional costs.

- E. At contract closeout, reflect approved changes in contract amounts in final statement of accounting.

1.6 CONSTRUCTION CONTINGENCY

- A. Following shall apply to construction contingency allowance:
 1. It shall be used only to cover cost of hidden, concealed or otherwise unforeseen conditions that develop during project.
 2. Work which is clearly change in scope shall be authorized and paid for only by means of change order executed in accordance with established Owner authorized procedures.
 3. Bidder shall include in his base bid on project his profit and overhead to cover amount of contingency; as each contingency authorization is processed, it will not include profit or overhead for Contractor.
 4. Contractor shall proceed with accomplishing work only after receiving properly executed contingency authorization executed by Owner.
 5. Contractor shall not bill Owner for work authorized by this procedure until work has been accomplished.
 6. Balance of contingency allowance which is not used during construction of project shall be returned to Owner.
 7. At completion of project, Architect will reconcile work accomplished through properly executed contingency allowance authorizations, and provide for refund of unused portion of contingency to Owner through properly executed Change Order.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCES

- A. Refer to list of Allowances on Drawings.

END OF SECTION

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SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

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

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. 1: Cutting and patching of concrete floor slabs.

1. Description: Cutting of new or existing concrete floor slabs up to 6 inches thick, removal and excavation as required, and subsequent backfill, compaction, and patching of concrete in accordance with Section 01 73 29 "Cutting and Patching." not otherwise indicated in the Contract Documents.
 2. Unit of Measurement: Square feet of concrete removed.
- B. Unit Price No. 2: Topical moisture vapor emission and alkalinity control of concrete floor slabs and cementitious underlayment installation in tile carpeted areas, wood flooring product areas, and resilient flooring product areas.
1. Description: Installation of topical moisture vapor emission and alkalinity control products and subsequent cementitious underlayment products to new or existing concrete floor slabs where the moisture vapor emissions and/or the alkalinity of the concrete floor slab exceeds the limits recommended by the manufacturer of the finished flooring product(s) to be installed. Preparation and installation of the topical moisture vapor emission and alkalinity control product and cementitious underlayment are to be completed in accordance with requirements of Section 09 61 05 "Moisture Vapor Emission and Alkalinity Control of Concrete Floor Slabs."
 2. Unit of Measurement: Square feet of products installed.
- C. Unit Price No. 3: Miscellaneous and structural steel.
1. Description: Miscellaneous lintels and other supports not otherwise indicated in the Contract Documents, in accordance with Section 05 50 00 "Metal Fabrications."
 2. Unit of Measurement: Cost in place of pounds of fabricated steel as indicated on itemized invoice of steel supplier and verified by the Architect.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification of each Alternate by number, and description of basic changes to be incorporated into Work.
2. Submission procedures.
3. Documentation of changes to Contract Sum and Contract Time.

1.2 REQUIREMENTS

- A. Submit Alternates with full description of proposed Alternative and effect on adjacent or related components.
- B. Alternates quoted on Bid Form will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
- C. Coordinate related work and modify surrounding work to integrate Work of each Alternative.

1.3 SELECTION AND AWARD OF ALTERNATIVES

- A. State the amount to be added to or to be deducted from the Base Bid for Alternates described below and list in Bid Form document or supplement to it, which requests a difference in Bid Price by adding to or deducting from Base Bid price.
- B. Bid will be evaluated on Base Bid price. After determination of preferred lowest bidder, consideration will be given to Alternates and Bid Price adjustments.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Refer to list of Alternates on Drawings.

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents, and proposed by Contractor, prior to award of Contract.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

B. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents, and are not subject to requirements specified in this Section.

1.3 SUBMITTALS

A. Substitution Requests: Architect will consider only written requests from Contractor for any substitution of products in place of those specified, using form provided at the end of this Section.

1. Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES or other applicable code organization.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

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

1.6 CONTRACTOR'S REPRESENTATION

- A. In making formal request for substitution Contractor represents that:
 - 1. He has investigated proposed product and has determined that it is equal to or superior in respects to that specified.
 - 2. He will provide same warranties or bonds for substitution as for product specified.
 - 3. He will coordinate installation of accepted substitution into Work, and will make such changes as may be required for Work to be complete.
 - 4. He waives claims for additional costs caused by substitution which may subsequently become apparent.
 - 5. Cost data is complete and includes related costs under his Contract, but not costs under separate contracts.

1.7 ARCHITECT DUTIES

- A. Architect will determine acceptability of proposed substitutions.
- B. Review Contractor's requests for substitutions with reasonable promptness.
- C. Notify Contractor, in writing, of decision to accept or reject requested substitution.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS, GENERAL

- A. Properties including, but not limited to following, will be considered as applicable:
 - 1. Physical dimension requirements to satisfy space limitations.
 - 2. Static and dynamic weight limitations, structural properties.
 - 3. Audible noise levels.
 - 4. Vibration generation.
 - 5. Interchangeability of parts or components.
 - 6. Accessibility for maintenance, possible removal or replacement.
 - 7. Colors, textures and compatibility with other materials, products, assemblies and components.
 - 8. Equipment capacities and performance characteristics.
- B. Substitutions will not be considered for acceptance when:
 - 1. They are indicated or implied on Shop Drawings, Product Data Submittals, or Requests for Information (RFIs).
 - 2. They are requested directly by subcontractor or supplier.

3. Acceptance would require substantial revisions to Contract Documents or Contract time.
 4. Additional cost to Owner is involved.
- C. Substitute products shall not be ordered or installed without written acceptance of Architect. If proposed substitution is not accepted, provide specified product or materials.
- D. Burden of proof of merits of proposed substitute is upon proposer. Architect's decision of acceptance or rejection of proposed substitution will be final.
- E. Review of Architect, acceptance or failure to take exceptions to substitutions or other review documents, shall not relieve Contractor of his responsibility for compliance with performance or other requirements of Contract Documents.
- F. Contractor shall be responsible for and pay for any expenses incurred by Owner or Architect for changes to Contract Documents ultimately required by accepted Contractor requests for substitutions.

2.2 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed, unless otherwise indicated.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SUBSTITUTION REQUEST FORM

To Architect: _____

Project Name: _____

SPECIFIED ITEM: _____

Section	Page	Paragraph	Description
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The undersigned Contractor requests consideration of the following:

PROPOSED SUBSTITUTION: _____

1. Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified, both on the proposed substitution and the original specified product.
2. Attached data also includes description of changes to Contract Documents, which proposed Substitution will require for its proper installation.

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

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

The Contractor further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item. The Contractor further warrants that the intent of specification section 01 25 00, Article 1.6 has been met.

1. Cost Reduction to the Owner: \$ _____

ACCEPTANCES:

- | | | |
|---------------------------|-------|--------------------|
| 1. Contractor Acceptance: | | Representing: |
| | Date: | |
| _____ | _____ | _____ |
| 2. Owner Acceptance: | | Representing |
| | Date: | |
| _____ | _____ | _____ |
| 3. Architect Acceptance: | | Representing |
| | Date: | Corgan Associates, |
| _____ | _____ | Inc. |
| _____ | _____ | _____ |

- _____ Accepted as Noted
- _____ Not Accepted
- _____ Received too late
- _____ Resubmit with complete information

SECTION 01 29 00
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Applications for Payment to Architect in accordance with schedule established by Conditions of Contract, and Agreement Between Owner and Contractor.
2. Schedule of Values allocated to various portions of Work in accordance with schedule established in this Section. Upon request of Architect, support values with data which substantiate correctness.
3. Unit Prices.
4. Change Order Procedures.

1.2 SCHEDULE OF VALUES

A. Preparation:

1. Coordinate preparation of Schedule of Values with preparation of Construction Progress Schedule.
2. Correlate line items in Schedule of Values with other required administrative schedules and forms, including following:
 - a. Construction Progress Schedule, in CPM or bar chart format.
 - b. Application for Payment form.
 - c. List of subcontractors.
 - d. Schedule of alternates.
 - e. List of products.
 - f. List of principal suppliers and fabricators.
 - g. Schedule of submittals.
3. Submit initial Schedule of Values to Architect within 14 days of Notice to Proceed.
4. Submit revised Schedule of Values at earliest possible date, but no later than minimum of 10 days before scheduled date of Initial Application for Payment.

B. Form and Content:

1. Arrange Schedule of Values on 8-1/2" x 11" tabular form on white paper in format acceptable to Architect.
2. Use bar chart or CPM chart as guide to establish format; compile information based on completed tasks.
3. Project Identification:

- a. Project name and location.
 - b. Name of Architect.
 - c. Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - f. Owner's contract designation.
4. Provide columns to indicate following for each item listed:
- a. Generic name.
 - b. Specific task description.
 - c. Change Orders numbers that have affected value.
 - d. Dollar value.
 - e. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
5. Follow table of contents of Project Manual as format for listing component items; identify each line item with number and title of respective major section of specifications.
6. Provide breakdown of Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports.
7. Break principal subcontract amounts down into several line items by completed task in various locations.
8. For each major line item, list sub-values of major products or operations under item.
9. Round amounts off to nearest whole dollar, total of listed values shall equal total Contract Sum.
10. For each part of Work where Application for Payment includes materials or equipment purchased, fabricated, and stored, but not yet installed, include separate line items on Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of Work.
- C. Margins of Cost:
1. Show line items for indirect costs, and margins on actual costs, only to extent that such items will be listed individually in Applications for Payment.
 2. Each item in Schedule of Values and Application for Payment shall be complete, including its total cost and proportionate share of general overhead and profit margin.
 3. At Contractor's option, temporary facilities and other major cost items that are not direct costs of actual work-in-place may be shown as separate line items in Schedule of Values.
 4. Furnish line item cost for each of following general cost items:
 - a. Bonds.
 - b. Insurance.
 - c. Field supervision and layout.
 - d. Temporary facilities and controls.
 - e. Testing.
- D. Resubmittal:

1. After review by Architect, revise and resubmit schedule as necessary.
2. Resubmit revised schedule monthly in same manner.

E. Subschedule of Unit Material Values:

1. Submit subschedule of unit costs and quantities for following:
 - a. Products specified under Unit Costs specified in Section 01 21 00.
 - b. Products on which progress payments will be requested for stored products.
2. Form and Content:
 - a. Form of submittal shall parallel that of Schedule of Values, with each item identified same as line item in Schedule of Values.
 - b. Unit quantity for bulk materials shall include an allowance for normal waste.
3. Unit values for materials shall be broken down as follows:
 - a. Cost of material, delivered and unloaded at Project Site, with taxes paid.
 - b. Installation costs, including overhead and profit.
4. Installed unit value multiplied by quantity listed shall equal cost of that item in Schedule of Values.
5. After review by Architect, revise and resubmit subschedules as necessary.
6. Resubmit revised subschedules monthly in same manner.

1.3 APPLICATIONS FOR PAYMENT

- A. Progress payments shall be made as Work proceeds at intervals stated in Contract.
- B. Work covered by Progress Payments shall, at time of payment, become property of Owner.
- C. Form of Application for Payment will be notarized AIA Document G702 - Application and Certification for Payment, supported by AIA Document G703 - Continuation Sheet, submitted in quadruplicate.
- D. Contractor shall submit to Architect within 15 days of execution of Owner -Contractor Agreement proposed sample of Lien Waiver and Bills Paid Affidavit forms for review and acceptance by Architect for use on this Contract.
- E. Conditions governing regular schedule for applications, payment, and retainage are as stated in Contract.
- F. Monthly Applications for Payment shall include Waivers of Liens for Work included in previous months' Application for Payment. Waiver of Liens for subcontractors and materialmen shall be total amount paid prior to previous month's Application for Payment.

- G. With each Application for Payment, Contractor shall certify that such Application for Payment represents just estimate of cost reimbursable to Contractor under terms of Contract, and shall also certify that there are no Mechanics' or Materialmens' Liens outstanding at date of Application for Payment, that due and payable bills with respect to Work have been paid to date or shall be paid from proceeds of Application for Payment, and that there is no known basis for filing of Mechanics' or Materialmens' Liens against surety in connection with Work, and that Waivers and Bills Paid Affidavit forms from subcontractors and materialmen have been, or will be, obtained in form specified in Contract.

1.4 UNIT PRICES

- A. Unit price is defined as amount stated in construction Contract as price for each unit of measurement for materials or services.

1.5 CHANGE ORDER PROCEDURES

- A. Submit to Architect within 10 days of execution of Owner-Contractor Agreement name of individual authorized to accept changes on behalf of Contractor, and shall be responsible for informing others in Contractor's employ of changes in Work.
- B. Change Order forms will be furnished and issued by Architect.
- C. Contractor Documentation of Changes:
 - 1. Maintain detailed records of Work done on accounting basis acceptable to Architect and Owner.
 - 2. Provide full information required for evaluation of proposed changes.
 - 3. Document each quotation for a change in cost or time with sufficient data to allow evaluation of quotation.
 - 4. On request, provide additional data to support computations:
 - a. Quantities of products, labor and equipment.
 - b. Insurance and bonds.
 - c. Overhead and profit.
 - d. Justification for change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 - 5. Support each request for additional costs, and for Work proposed on time and material basis, with description of products, equipment, cost of labor and subcontracts, completely documented.
 - 6. Computation for changes in Work will be computed in one of manners described in Conditions of the Contract.
- D. Initiation of Changes:
 - 1. Architect may submit Proposal Request which includes detailed description of change with supplementary or revised Drawings and Specifications.

2. Contractor may initiate proposed change by submittal of request to Architect describing proposed change with statement of reason for change, and proposed effect on Contract Sum and Contract Time with full documentation, and statement of effect on Work of separate contractors.
3. Document requested substitutions in accordance with Section 01 25 00.
4. Submission of such requests and receipt of same by Architect does not mean acceptance or approval of proposed change.

E. Authorization:

1. Owner may request, through Architect, Construction Change Directive, in writing, instructing Contractor to proceed with changes in Work, for subsequent inclusion in Change Order that is pending.
2. Directive will propose basis for necessary adjustments, to Contract Sum or Time.
3. Changes that affect Contract Sum or Contract Time will require Change Order signed by Owner and Architect.
4. Contractor's signature indicates agreement.
5. Orders, written or oral, by Owner through Architect or by Architect shall be treated as Change Order only if Contractor gives Owner proper written notice as described in Conditions of Contract.
6. Promptly execute change in Work only upon receipt of approved Change Order or Owner's written Construction Change Directive.

F. Execution:

1. Architect will issue Change Orders for signatures of parties as provided in Conditions of Contract.
2. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum as shown on Change Order.
3. Promptly revise Progress Schedules to reflect change in Contract Time, revise subschedules to adjust times for other items of Work affected by Change, and resubmit Schedule.
4. Promptly enter Changes in Project Record Documents.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

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SECTION 01 31 00
PROJECT COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General Project coordination of different Contract phases, trades and disciplines.
2. General coordination of construction site operations with operations of Owner.

1.2 GENERAL COORDINATION

- A. Coordinate scheduling, submittals, and work of various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements with provisions for accommodating items furnished by Owner to be installed by Contractor.
- B. Coordinate construction operations included under different sections of Project Manual that are dependent upon each other for proper installation, connection, and operation.
- C. Contractor shall review and coordinate requirements of Divisions 21, 23 and 26 in Project Manual and MEP drawings with other Work. Report discrepancies to Architect.
- D. Contractor shall maintain services of major subcontractors throughout duration of Contract, except as required by provisions of Conditions of Contract. Contractor shall notify Architect in writing of intention to replace subcontractors, outlining reasons for action and naming proposed replacement subcontractor.
- E. Each subcontractor shall ensure that devices and equipment installed under their subcontract is operational. Subcontractor shall inform Contractor when completion and operation of their system is dependent on Work of other trades. Arbitrate and resolve coordination conflicts between subcontractors to ensure complete and operational systems.
- F. Contractor shall be responsible for coordination of Work of subcontractors, and for recording subcontractor installation data on Project Record Documents in accordance with Section 01 78 39.
- G. Communications to Owner from Contractor regarding Contract requirements shall be through Architect.

1.3 COORDINATION MEETINGS

- A. In addition to Progress Meetings scheduled in Section 01 31 19, Contractor shall hold coordination meetings and pre-installation meetings with Contractor's personnel,

subcontractors, materialmen, and Architect, as necessary, to assure coordination of different trades and disciplines.

- B. Contractor shall schedule coordination and pre-installation meetings with Owner, Architect, Contractor and supplier to discuss hardware installation. Meeting shall initially be called within 30 days of Contract award.
- C. When necessary, prepare memoranda for distribution to each party outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings. Prepare similar memoranda for Owner and separate contractors when coordination of their work is required.
- D. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project close-out procedures.

1.4 COORDINATION OF SUBMITTALS

- A. Schedule and coordinate submittals.
- B. Coordinate Work of various trades having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate requests for substitutions to assure compatibility of space, of operating elements, effect on Work of other trades, and on Work scheduled for early completion.

1.5 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.

4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 14. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
- D. Architect's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 29 00.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.6 COORDINATION OF SPACE AND INSTALLATION SEQUENCE

- A. Coordinate use of Project space and sequence of installation of equipment, elevators, escalators, walks, mechanical, electrical, plumbing, or other Work that is indicated diagrammatically on Drawings. Follow routings shown for tubes, pipes, ducts, conduits, and other items as closely as practical, with due allowance for available physical space. Make runs parallel with lines of building, except where not feasible by construction. Utilize space efficiently to maximize accessibility for other installations, for Owner maintenance, and for repairs.
- B. Except as otherwise indicated in finished areas, conceal ducts, pipes, wiring, and other non-finish items within construction. Coordinate locations of concealed and exposed items with finish elements.
- C. Where availability of space is limited, coordinate installation of different components to ensure maximum accessibility for required maintenance, service and repair.
- D. Coordinate with architectural reflected ceiling plans exact location and dimensioning of exposed items and items which occur within hung ceilings. In event of conflict, request clarification from Architect prior to proceeding with fabrication or installation.
- E. Contractor shall be responsible for coordination of Work. Each subcontractor shall be responsible for coordination of their respective Work with the Work of the Contractor and other trades. Prepare coordination drawings in accordance with this Section.
- F. Where installation of one part of Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in sequence required to obtain best results.
- G. Make adequate provisions to accommodate items scheduled for later installation, including accepted Bid alternates, Owner-supplied Contractor-installed items, work by others, and installation of products purchased with allowances.

1.7 COORDINATION OF FINISHES

- A. Identify each room by name and number as it appears on Finish Schedules by posting room identification sign outside each room at main entry to each room. Identification shall be clearly visible, legible, and attached without damaging surface.
- B. Post accepted finishes scheduled for each room on each door or frame in manner that does not damage or stain surface. Use copy of accepted finish schedule that clearly identifies each finish and location of finishes for that particular room or area.
- C. Room identification signs and finish schedules shall remain posted until permanent interior signage has been installed and finishes have been reviewed by Architect, unless otherwise directed.
- D. Where mounting heights are not indicated, refer decisions to Architect prior to installation.

1.8 COORDINATION OF CONTRACT CLOSEOUT

- A. Coordinate completion and cleanup of Work of separate phases and sections in preparation for Substantial Completion of portions of Work designated for Owner partial occupancy.
- B. After Owner occupancy of premises, coordinate access to site by requirements of individual Specification Sections regarding correction of defective Work and Work not in accordance with Contract Documents. Minimize disruption of Owner's operations.
- C. Assemble and coordinate Closeout submittals in accordance with Section 01 77 00.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

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SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preconstruction meeting.
 - 2. Progress meetings.

1.2 GENERAL PROCEDURES

- A. Contractor shall schedule and administer pre-construction meeting, periodic progress meetings, and specially called meetings and conferences throughout progress of Work. Contractor shall:
 - 1. Prepare agenda for meetings.
 - 2. Distribute written notice of each meeting four working days minimum in advance of meeting date.
 - 3. Make physical arrangements for meetings.
 - 4. Preside at meetings.
- B. Representatives of Contractor, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of each represents.
- C. Architect will attend meetings to ascertain that Work is expedited consistent with Contract Documents and construction schedules.
- D. Contractor will record attendees and minutes of meetings, including significant proceedings and decisions. Contractor will reproduce and distribute copies of minutes after each meeting to attendees and to parties affected by decisions made at meeting.

1.3 PRE-CONSTRUCTION MEETING

- A. Pre-construction meeting will be held at construction job site prior to beginning of work at time designated by Architect, but not later than 15 days after date of Notice to Proceed.
- B. Representatives of Owner, Architect and Contractor, Contractor's Superintendent, and major subcontractors shall be present.
- C. Minimum Agenda:
 - 1. Major subcontractors and suppliers.

2. Tentative construction schedule.
3. Critical work sequencing and phasing of construction.
4. Major equipment deliveries and priorities.
5. Designation of responsible personnel.
6. Procedures and processing of field decisions, proposal requests, submittals, color coordination, change orders and applications for payment.
7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining Record Documents.
9. Review of Shop Drawings.
10. Use of premises.
11. Construction facilities, controls and construction aids.
12. Temporary utilities.
13. Security procedures.
14. Housekeeping procedures.
15. Discussion of project quality control procedures and requirements.

1.4 PROJECT PROGRESS MEETINGS

- A. Schedule regular periodic progress meetings at project field office, as required.
- B. Hold additional meetings as necessary by progress of construction activity.
- C. Representatives of Architect and his consultants as needed, Owner's project representative as needed, Contractor's Superintendent and major subcontractors as appropriate to agenda, shall be present.
- D. Minimum Agenda:
 1. Review and accept memorandum of previous meeting.
 2. Review of work progress since previous meeting.
 3. Field observations, problems, conflicts.
 4. Problems which impede Construction Schedule.
 5. Review of off-site fabrication and delivery schedules.
 6. Corrective measures and procedures to regain projected schedule.
 7. Revisions to Construction Schedule.
 8. Progress schedule for succeeding work period.
 9. Coordination of schedules.
 10. Review submittal schedules and status of submittals.
 11. Maintenance of quality standards.
 12. Pending changes and substitutions.
 13. Review proposed changes for effect on construction schedule, on completion, date and effect on other contracts of Project.
 14. Other applicable business.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

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SECTION 01 32 00

CONSTRUCTION PROGRESS SCHEDULES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for schedules required for proper performance of the Work.

1.2 FORMAT

- A. Prepare Schedules as horizontal bar chart with separate bar for each major portion of Work or operation, identifying first work day of each week, or prepare network analysis system using critical path method, as outlined in The Associated General Contractors of America (AGC) publication "The Use of CPM in Construction - A Manual for General Contractors".
- B. Sequence of Listings: Chronological order of start of each item of Work according to Table of Contents of this Project Manual.
- C. Scale and Spacing: To provide space for notations and revisions.
- D. Sheet Size: Multiples of 8-1/2" x 11".

1.3 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification Section number.
- C. Identify work of separate stages, separate floors and other logically grouped activities.
- D. Provide sub-schedules to define critical portions of entire Schedule.
- E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of first day of each month.
- F. Provide separate schedule of submittal dates for Shop Drawings, Product Data, and Samples, including Owner furnished products and products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision data for selection of finishes.
- G. Indicate delivery dates for Owner furnished products and products identified under Allowances.

- H. Coordinate content with Schedule of Values.

1.4 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.

1.5 SUBMITTALS

- A. Submit initial Schedules within seven days after date established in Notice to Proceed. After review, resubmit required revised data within five days.
- B. Submit revised Progress Schedules with each Application for Payment.
- C. Submit number of copies which Contractor requires, plus two copies which will be retained by Architect.

1.6 DISTRIBUTION

- A. Distribute copies of reviewed Schedules to project site file, Subcontractors, suppliers, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in Schedules.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Photography
 - 2. Views and Techniques
 - 3. Images
 - 4. Media

1.2 PHOTOGRAPHY

- A. Employ and pay photographer to take construction record photographs periodically during course of Work.
- B. Furnish construction photographs taken on commencement of Work and at monthly intervals.
- C. Submit prints and digital media monthly with each pay application.
- D. Photos may be incorporated into monthly construction report which should include schedule, progress of work, etc.
- E. Do not display photographs in publications, contests or other public or private forum without written consent of Owner and Architect.
- F. Parties requiring additional copies of digital images prints will order from and pay photographer directly.

PART 2 - PRODUCTS

2.1 DIGITAL IMAGES

- A. Provide color digital images, taken at 1028 x 768 minimum resolution.
- B. Size: Print images on 8.5" x 11" photograph quality paper, full resolution. Maximum two images per sheet.
- C. Bindings: 2" margin, placed on left hand of 10" side.

- D. Identify each print on back, listing time and date of exposure, location and orientation of view, project name and address of photographer, and photographer's numbered identification of exposure.

2.2 DIGITAL MEDIA

- A. Digital/media (CD Rom) images will become property of Owner.
- B. Catalog and index digital images in chronological sequence. Provide typed table of contents. Place negatives in archive negative sheets and compiled in three-ring commercial quality binder.

PART 3 - EXECUTION

3.1 VIEWS REQUIRED

- A. Consult with Architect for instructions concerning views required at each specified visit to site.
- B. Photograph from locations to adequately illustrate condition of construction and state of progress.
- C. Minimum views and quantities required:
- D. At each specified time, take photographs from 12 different views.
- E. Architect will have right to request fewer photographs be taken at certain intervals so that more photographs may be taken at other times, providing that total number of photographs remains unchanged.

3.2 DELIVERY OF DIGITAL IMAGES

- A. Deliver digital images prints with each monthly pay application.
- B. Deliver one set of digital images to Architect, one to Owner, and place one set of digital images in Project Record file as specified in Section 01 78 39.

END OF SECTION

SECTION 01 33 23
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule, administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 30 days of construction. List those submittals

- required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.4 SUBMITTAL ADMINISTRATIVE PROCEDURES

A. Contractor's Review:

1. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect
 - a. Apply Contractor's stamp to submittals, initialed or signed by authorized person and dated, certifying review of submittal, verification of products, field measurements and field construction criteria, and coordination of information within submittal with requirements of work and of Contract Documents.
 - b. Submittals without Contractor's stamp and submittals which, in Architect's or Owner's opinion are incomplete, contain numerous errors, or have not been checked or have only been checked superficially, will be returned without comments. Delays shall be Contractor's responsibility.
 - c. Contractor shall be responsible for quantities and dimensions shown on submittals.
2. Project Closeout Submittals: See requirements in Section 01 77 00 "Closeout Procedures."
3. Maintenance Material Submittals: See requirements in Section 01 78 00 "Extra Materials."

B. General Submission Requirements:

1. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in Work. Submittals shall be made to Architect by Contractor only.
2. Submit shop drawings, product data and samples for structural, mechanical and electrical items directly to consulting engineer with copy of transmittal sent to Architect. Upon completion of review, consulting engineer will send shop drawings, product data and samples to Architect.
3. Number of Submittals Required:
4. Paper Shop Drawings: Submit copies Contractor requires, plus one copy that will be retained by Architect; submit one additional copy for structural, mechanical, electrical or plumbing work.
5. Paper Product Data: Submit copies Contractor requires, plus two copies that will be retained by Architect.
6. Physical Samples: Submit samples of items requested in each specification section; submit minimum of three samples for each item.
7. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals unless Architect gives specific written acceptance of specific deviations.

C. Processing Time:

1. Architect will process submittals as quickly as possible.
2. Submittals of certain finish, texture and color items requiring selection by Architect may be retained until necessary samples from other submittals have been submitted so Architect can coordinate selections.
3. 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.
4. Allow time for submittal review, including time for resubmittals, as follows:
 - a. Initial Review: Allow seven days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - b. Resubmittal Review: Allow 7 days for review of each resubmittal.
 - c. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 days for initial review of each submittal.

D. Paper Submittal Requirements: Place a permanent label or title block on each submittal item 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 (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.

- d. Name of Construction Manager.
- e. Name of Contractor.
- f. Name of subcontractor.
- g. Name of supplier.
- h. Name of manufacturer.
- i. Submittal number, including revision identifier, and any other unique identifiers at Contractor's discretion.
 - 1) Submittal shall use the Specification Section number, with spaces, followed by a dash and then a sequential 3-digit submittal number (e.g., 06 10 53 - 001). Submittal shall also include a 2-digit revision identifier suffix after another dash, starting with "00" on the initial submission (e.g., 06 10 53 - 001 - 00).
- j. Number and title of appropriate Specification Section.
- k. Drawing number and detail references, as appropriate.
- l. Location(s) where product is to be installed, as appropriate.
- m. Other necessary identification.

- 4. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor. Provide locations on form for the following information:

- a. Project name.
- b. Date.
- c. Destination (To:).
- d. Source (From:).
- e. Name and address of Architect.
- f. Name of Construction Manager.
- g. Name of Contractor.
- h. Name of firm or entity that prepared submittal.
- i. Names of subcontractor, manufacturer, and supplier.
- j. Type of submittal.
- k. Submittal purpose and description.
- l. Specification Section number and title.
- m. Specification paragraph number or drawing designation and generic name for each of multiple items.
- n. Drawing number and detail references, as appropriate.
- o. Indication of full or partial submittal.
- p. Transmittal number, numbered consecutively.
- q. Submittal and transmittal distribution record.
- r. Remarks.
- s. Signature of transmitter.

E. Electronic Submittal Requirements:

- 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number, including revision identifier, and any other unique identifiers at Contractor's discretion.
 - a. File name and submittal number shall use the Specification Section number, with spaces, followed by a dash and then a sequential 3-digit submittal number (e.g., 06 10 53 - 001). File name and submittal shall also include a 2-digit revision identifier suffix after another dash, starting with "00" on the initial submission (e.g., 06 10 53 - 001 - 00).
3. Provide electronic stamp to permanently record Contractor's review and approval markings and space for electronic stamp for action taken by Architect and Consultants as needed.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Project team, containing the following information:
 - a. Project name.
 - b. Date.
 - c. File name and submittal number.
 - d. Name and address of Architect.
 - e. Name of Construction Manager.
 - f. Name of Contractor.
 - g. Name of firm or entity that prepared submittal.
 - h. Names of subcontractor, manufacturer, and supplier.
 - i. Type of submittal.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
6. Post electronic submittals in Adobe PDF format directly to Newforma Info Exchange at <https://projects.corgan.com/>.
7. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

F. Resubmission Requirements:

1. Make corrections or changes in submittals required by Architect, mark number of submission, and resubmit as required until accepted.
2. Shop Drawings and Product Data:
 - a. Revise initial drawings or data, and resubmit as specified for initial submittal.
 - b. Indicate changes which have been made other than those requested by Architect.
 - c. Mark number of submission and resubmit until accepted.
3. Samples: Submit new samples as required for initial submittal. Remove samples which are "rejected" or designated "resubmit".

G. Architect Duties:

1. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 - a. Final Unrestricted Release: When submittal is marked "No Exception Taken", that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 - b. Final-But-Restricted Release: When submittal is marked "Comments Included", that part of the Work covered by the submittal may proceed provided it complies with both the Architect's notations and comments on the submittal and requirements of the Contract Documents; final acceptance will depend upon that compliance.
 - c. Submit Specified Item: When submittal is marked "Rejected" do not proceed with that part of the work as submission does not conform to requirements of Contract Documents. Resubmission of the same product will not be considered. Prepare and submit new submittal meeting requirements of Contract Documents.
 - d. Returned for Resubmittal: When submittal is marked "Revise and Submit", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the Architects notations or corrections; resubmit without delay.
 - 1) Do not permit submittals marked "Revise and Submit" to be used at the project site or elsewhere where construction is in progress.
 - e. Other Action: When submittal is marked "Not Reviewed" it has not been reviewed because the submittal was neither requested nor required.
2. 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.

3. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
4. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
5. Submittals not required by the Contract Documents may be returned by the Architect without action.
6. Review of submittals is only for conformance with design concept of Project and compliance with information given in Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at job site, information that pertains solely to fabrication process or to techniques of construction and for coordination of work of trades. Acceptance shall not relieve Contractor of responsibility for deviation from requirements of Contract Documents.

H. Distribution:

1. Distribute reproductions of Shop Drawings and copies of Product Data which have been reviewed by Architect and do not require revisions.
 - a. Job site file.
 - b. Project Record Documents file.
 - c. Other affected contractors.
 - d. Subcontractors.
 - e. Supplier or Fabricator.
2. Distribute accepted samples as directed by Architect.

I. Shop Drawings:

1. Present drawings in clear and thorough manner.
2. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
3. Consecutively number shop drawings for each section of work. Retain numbering system throughout revisions.
4. Show detail, materials, dimensions, thicknesses, methods of assembly, attachments, relationship to adjoining Work and other pertinent data and information.
5. Verify dimensions and field conditions. Clearly indicate field dimensions and field conditions.
6. Check and coordinate shop drawings of section or trade with requirements of other sections or trades as related and as required for proper and complete installation of work.
7. Prepare composite shop drawings and installation layouts when necessary or requested to depict proposed solutions for tight field conditions. Coordinate in field and with affected subcontractors for proper relationship to work of other trades based on field conditions.

J. Product Data:

1. Preparation:
 - a. Clearly mark each copy to identify pertinent products or models.

- b. Show performance characteristics and capacities.
 - c. Show dimensions and clearances required.
 - d. Show wiring or piping diagrams and controls.
 - e. Indicate specified finish.
 - 2. Manufacturer's Standard Schematic Drawings and Diagrams:
 - a. Modify drawings and diagrams to delete information which is not applicable to Work.
 - b. Supplement standard information to provide information specifically applicable to Work.
- K. Samples:
- 1. Provide minimum three office samples of sufficient size to clearly illustrate functional characteristics of product, with integrally related parts and attachment devices; and full range of color, texture and pattern.
 - 2. Project Record Document Samples:
 - a. Items requiring submittal for color, texture or finish selection shall be included in Record Document Finish Manual required by Section 01 78 39.
 - b. Sample of selected color, texture or finish shall be provided on 4" x 4" sample chip, suitable for adhering to cardboard page in Record Document Manual.
 - c. Record sample shall match actual material installed.
 - d. Contractor shall prepare record samples, assemble on pages, and submit in accordance with requirements of Section 01 78 39.
 - e. Contractor shall submit two copies of Record Document Finish Manuals.
- L. Delegated-Design Services:
- 1. Performance and Design Criteria: Where professional design services, calculations, 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.
 - a. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
 - 2. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of calculations or certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - a. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

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SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: General regulatory requirements.

1.2 REFERENCES

- A. ASTM International
1. ASTM E 119: Test Methods for Fire Tests of Building Construction and Materials
- B. Underwriters Laboratories Inc.
1. UL 263: Fire Tests of Building Construction and Materials.

1.3 GENERAL REQUIREMENTS

- A. General: Additional information with legal implications regarding applicable governing laws and jurisdictions can be found in Conditions of Contract.
- B. Codes:
1. Where references are made on Drawings or Specifications to codes, they shall be considered an integral part of the Contract Documents as minimum standards. Nothing contained in Contract Documents shall be so construed as to be in conflict with law, bylaw or regulation of municipal, State, Federal or other authorities having jurisdiction.
 2. Perform Work in compliance with:
 - a. Codes listed on Drawings.
 - b. National, state and local barrier free codes, laws and ordinances.
 - c. NFPA 101 - Life Safety Code and other applicable NFPA Standards.
- C. Contractor shall, without additional expense to Owner, obtain necessary licenses and permits, and be responsible for complying with Federal, state, county, and municipal laws, codes, and regulations applicable to performance of Work, including, but not limited to, laws or regulations requiring use of licensed contractors to perform parts of Work.
- D. Occupancy Permit: The General Contractor shall be responsible for securing a Certificate of Occupancy permit at completion of project and shall deliver such permit to Owner. Final Payment shall be retained until permit has been received by Owner.

1.4 FIRE-RESISTANCE REQUIREMENTS

- A. Fire Resistance Ratings and Fire Tests: Fire-resistance ratings of building elements, components, and assemblies shall be determined only in accordance with the test procedures set forth in ASTM E 119 or UL 263, or by alternative methods approved by applicable authorities having jurisdiction.
1. Fire-resistance ratings shall be determined or listed based on fire tests performed by one of the following testing agencies, or other agencies acceptable to governing authorities having jurisdiction.
 - a. Factory Mutual Laboratories.
 - b. Intertek
 - c. Southwest Research Institute.
 - d. Underwriters Laboratories, Inc.
 2. Where reference is made to only one testing authority, equivalent fire ratings as determined or listed by another testing agency are acceptable if approved by applicable authorities having jurisdiction.
- B. Marking and Identification: Fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions, or any other walls required to have protected openings or penetrations, shall be permanently identified with signage or stenciling. Such identification shall:
1. Be located in accessible floor plenums, ceiling plenums, or attic spaces.
 2. Be repeated at intervals not exceeding 30 feet o.c., measured horizontally along the partition or wall.
 3. Include lettering not less than 0.5- inch in height, worded as follows: "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS AND PENETRATIONS."

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. "Acceptance", "acceptable", or words of similar import: Acceptance, acceptable or similar words shall be as determined by Architect.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract. Approval does not release Contractor from responsibility to fulfill Contract Document requirements.
- C. "At no extra cost to Owner", "With no extra compensation to Contractor", "At Contractor's own expense", or words of similar import: Terms shall be understood to mean that Contractor shall perform or provide specified operation of Work at no increase to Contract Sum stated in executed Contract.
- D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- E. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated." No limitation on location is intended except as specifically noted.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Installer" is entity engaged by Contractor, either as employee, subcontractor or sub-subcontractor for performance of particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in operations they are engaged to perform. Term "experienced", when used with term "installer", means having minimum five previous projects similar in size and scope to this Project, and familiar with precautions required, and has complied with requirements of authority having jurisdiction.
- I. "NIC": Work of this Project which is not being performed or provided as part of Contract; term shall mean "Not in This Contract" or "Not Part of Work to be Performed"

or Provided by Contractor". "NIC" work is indicated as aid to Contractor in scheduling amount of time and materials necessary for completion of Contract.

- J. "Other acceptable manufacturer", "equal", "acceptable equal", "equivalent", or words of similar import: It shall be understood that words are followed by expression "at sole discretion of Architect" even though words may not appear in print.
- K. "Perform": Contractor, at his own expense, shall perform operations necessary to complete Work, including furnishing of necessary labor, tools and equipment, and further including and installing of materials indicated, specified or required to complete performance.
- L. "Project Site" is space available to Contractor for performance of Work, either exclusively or in conjunction with others performing construction as part of Project. Extent of Project Site is shown on Contract Drawings, and may or may not be identical with description of land upon which Project is to be built.
- M. "Provide": Contractor, at his own expense, shall furnish and install Work complete in place and ready for use, including furnishing of necessary labor, materials, tools, equipment and transportation. Definitions apply same to future, present and past tenses, except word "provided" may mean "contingent upon" where context is apparent.
- N. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- O. "Require" and words of similar import: As required to complete Work and as required by Architect.
- P. "Testing Laboratory" is independent entity engaged to perform specific inspections or tests, either at Project Site or elsewhere, and to report on, and if required, to interpret results of those inspections or tests.

1.2 SPECIFICATION SENTENCE STRUCTURE

- A. Specifications are written in modified brief style. In general, words "the", "a", "an", "shall", "shall be", and "all" are not used. Requirements indicated and specified apply to work of same kind, class, and type even though word "all" is not stated.
- B. Simple imperative mood of sentence structure is used in Specification Sections which places verb as first word in sentence. Where "perform", "provide", "install", "erect", "furnish", "connect", "test", or words of similar import are used, it shall be understood that words include meanings of phrase "Contractor Shall..." before words.
- C. Standard paragraph titles and other identifications of subject matter in Specifications are intended as aid in locating and recognizing various requirements in Specifications. Titles do not define, limit or otherwise restrict Specifications text. Capitalizing of words in text does not signify or mean that words convey special or unique meanings having

precedence over other parts of Contract Documents. Specification text shall govern over titling and shall be understood to be interpreted as a whole.

1.3 DOCUMENT ORGANIZATION

- A. Organization of Project Manual and Contract Drawings are not intended to control or to lessen responsibility of Contractor in dividing Work among his subcontractors, or in establishing extent of Work to be performed by each trade.

1.4 SYMBOLS

- A. Graphic symbols used in Contract Documents are those symbols recognized in construction industry for indicated purposes. Where not otherwise noted, symbols are those defined in "Architectural Graphics Standards", published by John Wiley & Sons, Inc., Eighth Edition.
- B. Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, mechanical and electrical symbols are supplemented by more specific symbols recommended by technical associations including ASME, ASPE, IEEE, and similar organizations. Request clarification from Architect if symbols are unfamiliar.

1.5 REFERENCE STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
 - 1. When conflict exists between requirements of reference standards and Contract Documents, request clarification from Architect before proceeding.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
 - 2. Make reference standards available as requested or required by Architect or Owner. Maintain copies of standard at project site throughout construction period.

1.6 ABBREVIATIONS AND ACRONYMS

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

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
4. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
5. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
6. AF&PA - American Forest & Paper Association; www.afandpa.org.
7. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
8. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
9. AIA - American Institute of Architects (The); www.aia.org.
10. AISC - American Institute of Steel Construction; www.aisc.org.
11. AISI - American Iron and Steel Institute; www.steel.org.
12. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
13. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
14. ANSI - American National Standards Institute; www.ansi.org.
15. APA - APA - The Engineered Wood Association; www.apawood.org.
16. APA - Architectural Precast Association; www.archprecast.org.
17. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
18. ARI - American Refrigeration Institute; (See AHRI).
19. ASCE - American Society of Civil Engineers; www.asce.org.
20. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
21. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
22. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
23. ASSE - American Society of Safety Engineers (The); www.asse.org.
24. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
25. ASTM - ASTM International; www.astm.org.
26. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
27. AWI - Architectural Woodwork Institute; www.awinet.org.
28. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
29. AWPA - American Wood Protection Association; www.awpa.com.
30. AWS - American Welding Society; www.aws.org.
31. AWWA - American Water Works Association; www.awwa.org.
32. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
33. BIA - Brick Industry Association (The); www.gobrick.com.
34. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.

35. CEA - Consumer Electronics Association; www.ce.org.
36. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
37. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
38. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
39. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
40. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
41. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
42. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
43. CSI - Construction Specifications Institute (The); www.csinet.org.
44. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
45. CWC - Composite Wood Council; (See CPA).
46. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
47. DHI - Door and Hardware Institute; www.dhi.org.
48. ECA - Electronic Components Association; (See ECIA).
49. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
50. ECIA - Electronic Components Industry Association; www.eciaonline.org.
51. EIA - Electronic Industries Alliance; (See TIA).
52. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
53. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
54. FM Approvals - FM Approvals LLC; www.fmglobal.com.
55. GA - Gypsum Association; www.gypsum.org.
56. GANA - Glass Association of North America; www.glasswebsite.com.
57. GS - Green Seal; www.greenseal.org.
58. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
59. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
60. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
61. IAS - International Accreditation Service; www.iasonline.org.
62. IAS - International Approval Services; (See CSA).
63. ICBO - International Conference of Building Officials; (See ICC).
64. ICC - International Code Council; www.iccsafe.org.
65. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
66. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
67. IESNA - Illuminating Engineering Society of North America; (See IES).
68. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
69. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
70. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
71. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
72. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
73. ISO - International Organization for Standardization; www.iso.org.
74. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
75. ITU - International Telecommunication Union; www.itu.int/home.
76. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
77. LMA - Laminating Materials Association; (See CPA).
78. LPI - Lightning Protection Institute; www.lightning.org.

79. MCA - Metal Construction Association; www.metalconstruction.org.
80. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
81. MFMA - Metal Framing Manufacturers Association, Inc.;
www.metalframingmfg.org.
82. MIA - Marble Institute of America; www.marble-institute.com.
83. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
84. MPI - Master Painters Institute; www.paintinfo.com.
85. NAAMM - National Association of Architectural Metal Manufacturers;
www.naamm.org.
86. NADCA - National Air Duct Cleaners Association; www.nadca.com.
87. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
88. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
89. NBI - New Buildings Institute; www.newbuildings.org.
90. NCMA - National Concrete Masonry Association; www.ncma.org.
91. NECA - National Electrical Contractors Association; www.necanet.org.
92. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
93. NEMA - National Electrical Manufacturers Association; www.nema.org.
94. NETA - InterNational Electrical Testing Association; www.netaworld.org.
95. NFPA - National Fire Protection Association; www.nfpa.org.
96. NFPA - NFPA International; (See NFPA).
97. NFRC - National Fenestration Rating Council; www.nfrc.org.
98. NHLA - National Hardwood Lumber Association; www.nhla.com.
99. NLGA - National Lumber Grades Authority; www.nlga.org.
100. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
101. NOMMA - National Ornamental & Miscellaneous Metals Association;
www.nomma.org.
102. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
103. NSF - NSF International; www.nsf.org.
104. NSPE - National Society of Professional Engineers; www.nspe.org.
105. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
106. NWFA - National Wood Flooring Association; www.nwfa.org.
107. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
108. RFCI - Resilient Floor Covering Institute; www.rfci.com.
109. SAE - SAE International; www.sae.org.
110. SDI - Steel Deck Institute; www.sdi.org.
111. SDI - Steel Door Institute; www.steeldoor.org.
112. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers;
(See ASCE).
113. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association;
www.smacna.org.
114. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
115. SPIB - Southern Pine Inspection Bureau; www.spib.org.
116. SSINA - Specialty Steel Industry of North America; www.ssina.com.
117. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
118. SWI - Steel Window Institute; www.steelwindows.com.
119. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
120. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance);
www.tiaonline.org.

121. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
122. TMS - The Masonry Society; www.masonrysociety.org.
123. UL - Underwriters Laboratories Inc.; www.ul.com.
124. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
125. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
126. WDMA - Window & Door Manufacturers Association; www.wdma.com.
127. WI - Woodwork Institute; www.wicnet.org.
128. WWPA - Western Wood Products Association; www.wwpa.org.

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

1. DIN - Deutsches Institut für Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. GSA - General Services Administration; www.gsa.gov.
8. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
9. OSHA - Occupational Safety & Health Administration; www.osha.gov.
10. SD - Department of State; www.state.gov.
11. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
12. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
13. USPS - United States Postal Service; www.usps.com.

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

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.

2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 3. DSCC - Defense Supply Center Columbus; (See FS).
 4. FED-STD - Federal Standard; (See FS).
 5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 6. MILSPEC - Military Specification and Standards; (See DOD).
 7. USAB - United States Access Board; www.access-board.gov.
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CDHS; California Department of Health Services; (See CDPH).
 2. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
 3. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 45 16

CONTRACTOR'S QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes Contractor's administrative and procedural requirements for quality assurance and quality control.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- D. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- E. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or

quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

1.5 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within five days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- E. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.6 REPORTS AND DOCUMENTS

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

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project,

whose work has resulted in construction with a record of successful in-service performance.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed unless otherwise indicated.

1.8 QUALITY CONTROL

- A. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 23 "Shop Drawings, Product Data, and Samples."
- B. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- C. Coordination: Coordinate sequence of activities to accommodate required testing, quality-assurance, and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01 45 36
CONCRETE IMAGING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Procedural requirements for the nondestructive examination (NDE) of concrete, three-dimensionally locating, mapping and identifying embedments in the concrete in advance of drilling, coring, cutting or breaking activities.
 - 1. NDE services include inspections, tests, and related actions, including reports performed by an approved, independent testing agency.
 - 2. NDE services are required to verify compliance with requirements specified or indicated in the contract documents. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- B. Requirements for the Contractor to provide other quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Work: The following Sections contain requirements that relate to this Section:
 - 1. Section 01 73 29 "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
 - 2. Section 01 33 23 "Shop Drawings, Product Data and Samples" specifies requirements for development of a schedule of required tests and inspections.

1.2 RESPONSIBILITIES

- A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide all NDE inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.
- B. Retesting: The Contractor is responsible for retesting where results of NDE inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
- C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the NDE agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 - 1. Provide access to the Work.

2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 3. Provide the NDE agency with available as-built and project design documentation as requested by the agency.
- D. Duties of the NDE Testing Agency: The independent agency engaged to perform concrete NDE inspections and surveys shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the Architect and the Contractor promptly of potential clashes between proposed penetrations of the subject concrete and embedments observed in the Work during performance of its services.
 2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 3. The agency shall not perform any duties of the Contractor.
- E. Coordination: Coordinate the sequence of activities to accommodate required NDE services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
- F. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.3 SUBMITTALS

- A. The independent NDE testing agency shall submit a written report, in duplicate, of each inspection, test, survey, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of tests or inspection
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method(s).
 - g. Complete NDE test data with annotations.
 - h. Survey results and an interpretation of the results.
 - i. Site conditions at the time of NDE testing.
 - j. Comments or professional opinions on whether proposed concrete penetrations clash or interfere with observed embedments in the concrete.
 - k. Name and signature of NDE report preparer.
 - l. Recommendations on retesting.

1.4 QUALITY ASSURANCE

A. Qualifications for NDE Service Agencies:

1. NDE agency, shall possess a minimum of ten (10) years demonstrated successful experience in the use of ground penetrating radar (GPR) for the three-dimensional locating, mapping and identification of concrete embedments for similar, mission-critical, facilities.
2. GPR field technicians and analysts shall possess a minimum of five years (5) demonstrated successful experience in the use of ground penetrating radar (GPR) for the three-dimensional locating, mapping and identification of concrete embedments for similar, mission-critical, facilities.
3. Demonstrated ability to accurately, dimensionally-locate concrete survey and data collection areas.
4. Ability to archive all project reports, collected data, and all related documents for a period of not less than five (5) years from completion of the NDE Work.
5. Professional Liability Insurance ("Errors and Omissions") with minimum limits of \$2 million per occurrence / \$2 million annual aggregate.
6. NDE Work shall be performed in accordance with the applicable sections of ASTM D6432, CSDA Best Practice BP-007, and as amended herein.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 NONDESTRUCTIVE EXAMINATION (NDE) OF CONCRETE

- A. Ground penetrating radar (GPR) shall be the primary NDE investigative tool deployed for the three dimensional (3D) imaging of concrete.
- B. Prior to any drilling, coring, cutting, or breaking of concrete, the area shall be imaged utilizing GPR by an approved NDE agency and evaluated by the agency for potential clashes with embedded elements in the concrete (conduit, piping, reinforcing bar, post tensioning tendons, etc.).

3.2 GROUND PENETRATING RADAR (GPR)

- A. GPR system shall utilize a ground coupled antenna system with minimum center frequency of 1000 MHz.
- B. Data shall be collected utilizing defined, bi-directional grids with supplemental line scans being performed as deemed necessary by the operator. Data shall be collected on a grid basis, unless physical constraints restrict the data collection process to only line scans.

- C. Grid locations shall be dimensionally located relative to fixed building or site elements. The grid origin position and grid axis orientation shall be identified and recorded.
- D. Data shall be initially processed on-site, with observed embedments "real-time" marked on the concrete surface. Marking methods and materials shall be approved by the Owner in advance of the NDE services commencing. Marks shall be documented using digital photography.
- E. Data shall be digitally recorded and post-processed utilizing the system manufacturer's analytical software. Line scan images and GPR plan map images shall be annotated to convey the nature and three dimensional location of observed embedments. Annotated images shall be included as part of each written report.

3.3 RESTRICTION ON LOCATION OF PROPOSED CONCRETE PENETRATIONS

- A. Concrete penetrations shall not be made within four inches (4") of any fixed obstruction (wall, etc.) due to the physical limitation presented by the typical GPR antenna dimensions.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements governing the selection of products for use in the project.
2. Product delivery, storage, and handling.
3. Manufacturers' standard and special warranties on products.
4. Manufacturers' instructions and certifications.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. **Named Products:** Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. **New Products:** Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. **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.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 SUBMITTALS

A. Proposed Products List: Within period of 30 days after award of Contract, submit to Architect five (5) copies of complete list of major Products, which are proposed for installation.

1. Tabulate products by Specification Section number, title, and Article number.

2. For products specified only by reference standards, list for each such product:
 - a. Name and address of manufacturer.
 - b. Trade name.
 - c. Model or catalogue designation.
 - d. Manufacturer's Data including reference standards and performance test data.
3. Architect will reply promptly in writing stating whether there is reasonable objection to any listed items. Failure to object to a listed item shall not constitute waiver of requirements of Contract Documents.

1.4 QUALITY ASSURANCE

- A. Materials specified are to a define standard of quality or performance and to establish basis for evaluation of proposals and substitutions.
- B. Comply with individual Specification Sections and referenced standards as minimum requirements.
- C. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- D. Source Limitations: Components required to be supplied in quantity within Specification Section shall be of same manufacturer and shall be interchangeable.
- E. Nameplates and Labels: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trade marks on surfaces of products which will be exposed to view in occupied spaces or on the exterior:
 1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface approved by Architect and governing authorities.
 2. Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturers printed instructions, obtain and distribute copies of instructions to parties involved in installation, including two copies to Architect, prior to commencing work.

1. Maintain one set of complete instructions at job site during installation and until complete.
2. Maintain one set of complete instructions for Project Record Documents.

B. Handle, install, connect, clean, condition and adjust products in strict accord with manufacturer's instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, notify Architect in writing for further instructions.
2. Do not proceed with work without clear instructions.

- C. Perform Work in accordance with manufacturer's instructions. Do not omit preparatory steps of installation procedures unless specifically modified or exempted by Contract Documents.

1.7 MANUFACTURER CERTIFICATION

- A. Prior to Final Acceptance of Work, for items designated in Specification Sections, an authorized representative of each manufacturer of materials or equipment installed under work of that Section shall examine installation and operation of his materials, system and equipment to determine they are correctly installed and operating properly.
- B. Examination and testing shall be accomplished for work which will be concealed during execution of Work, after completion of installation and prior to concealment and for Work which will not be concealed, at completion of Work.
- C. Each representative shall submit signed statement to Owner, through Contractor, certifying to his examination and to correct installation and proper operation of materials, systems or equipment. Certification shall list items included.
- D. Contractor shall transmit certifications to Architect at or prior to Final Acceptance Inspection. Transmittal shall include list of certifications included.

1.8 MAINTENANCE

- A. For mechanical and electrical equipment in long-term storage, provide manufacturer's service instructions shown on exterior of package.
- B. Service equipment on a regular basis as recommended by manufacturer. Maintain log of maintenance services. Submit log as Project Record Document in accordance with requirements of Section 01 78 39.

1.9 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience.
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless Section 01 25 00 - "Substitutions" is referenced.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed,

or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless Section 01 25 00 - "Substitutions" is referenced.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Performance Specifications Requirements: Where specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated.
- D. Compliance with Standards, Codes and Regulations: Where specifications require compliance with an imposed code, standard or regulation, select a product that complies with the code, standard or regulations specified.
- E. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- F. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

2.3 SUBSTITUTIONS

- A. Refer to Section 01 25 00 - "Substitution Procedures."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Make periodic examinations of stored materials to verify that products are maintained under specified conditions and are free from damage or deterioration.
- B. Verify that storage facilities comply with manufacturer's product storage requirements.
- C. Verify that manufacturer required environmental conditions are maintained continually.
- D. Verify that surfaces of products exposed to elements are not adversely affected and that weathering of finishes is within acceptable tolerances under requirements of Contract Documents.

3.2 PROTECTION

- A. Furnish protection against weather. Cover building openings to protect interior of building from weather.
- B. Maintain work, materials, apparatus and fixtures free from damage.
- C. Protect items having factory finish to prevent damage to finish and equipment.

- D. At end of day's work, cover new work likely to be damaged or otherwise protect as necessary.
- E. After installation, secure substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations.
- F. Remove protection when no longer needed. Upon completion of work, remove storage facilities from site.

3.3 ADJUSTING

- A. Do not use materials in work which have deteriorated, become damaged or are otherwise unfit for use.
- B. Replace stored items damaged by inadequate protection or environmental controls.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements and limitations of cutting and patching of Work.
2. Execute cutting, fitting and patching, including attendant excavation and backfill, required to complete Work or to:
 - a. Make its several parts fit together properly.
 - b. Uncover portions of the Work to provide for installation of ill-timed work.
 - c. Remove and replace defective work.
 - d. Remove and replace work not conforming to requirements of Contract Documents.
 - e. Remove samples of installed work as specified for testing.
 - f. Make routine penetrations of non-structural surfaces for installation of mechanical, electrical and plumbing Work.
 - g. Uncover work that has been covered prior to Architect's required observation.

1.2 SUBMITTALS

A. Submit written request to Architect in advance of executing cutting or alteration, other than required by Contract Documents, which affects:

1. Work of Owner or separate contractor.
2. Structural value or integrity of any element of Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance or safety of operational elements.
5. Visual qualities of sight-exposed elements.

B. Request shall include:

1. Identification of Project.
2. Location and description of affected work.
3. Necessity for cutting, alteration or excavation.
4. Effect on work of Owner or separate contractor, or on structural or weatherproof integrity of Project.
5. Description of proposed work:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades who will execute work.

- c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - e. Cost proposal when applicable.
- 6. Alternatives to cutting and patching.
- 7. Written permission of separate contractor whose work will be affected.
- C. Should conditions of Work or schedule indicate change of products from original installation, Contractor shall submit request for substitution as specified in Section 01 25 00.
- D. Submit written notice to Architect designating date and time work will be uncovered or altered.

1.3 COORDINATION

- A. Where warranties are in force for existing work, coordinate cutting and patching work with manufacturer and installer of warranted product to avoid voiding warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with specifications and standards for each specific product involved.
- B. Should conditions of work or schedule indicate change of products from original installation, submit request for substitution as specified in Section 01 25 00.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine existing conditions of Project, including elements subject to damage or to movement during cutting, patching, excavating, and backfilling.
- B. After uncovering work, examine conditions affecting installation of Products, or performance of work.
- C. Report unsatisfactory or questionable conditions to Architect in writing. Do not proceed with work until Architect has provided further instructions.

3.2 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of Work.

- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work.
- D. Maintain excavations free from water.

3.3 DUST CONTROL

- A. Provide positive methods of dust control and apply dust control materials to minimize raising dust from cutting and patching operations.

3.4 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
- B. Execute fitting and adjustment of products to provide finished installation to comply with specified products, functions, tolerances and finishes.
- C. Restore work which has been cut or removed. Install new products to provide Work in accordance with requirements of Contract Documents.
- D. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Where fire-rated separations are penetrated, fill space around pipe or insert with material with physical characteristics equivalent to fire-resistance requirement of penetrated surface.
- E. Refinish entire surfaces as necessary to provide even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For assembly, refinish entire unit.
- F. Employ original installer or fabricator of work performed under this Contract to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.

END OF SECTION

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SECTION 01 74 13
CONSTRUCTION CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cleaning and disposal of waste materials, debris, and rubbish during construction.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Hazard Control: Store volatile waste in covered metal containers and remove from premises daily.
 - 2. Pollution Control: Conduct cleaning and disposal operations to comply with local codes, ordinances, and anti-pollution laws.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Provide acceptable covered containers for deposit of waste materials, debris and rubbish.
- B. Use only cleaning materials which will not create hazards to health and property, and which will not damage surfaces.
- C. Use only those cleaning materials recommended by manufacturer of surface to be cleaned.
- D. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 CLEANING DURING CONSTRUCTION

- A. Execute daily "broom-clean" construction cleaning to keep Work, site and adjacent properties free from accumulations of waste materials, rubbish and debris. Maintain site in a clean and orderly condition including the following:

1. Remove debris and rubbish from pipe chases, plenums, attics, and other closed or remote spaces, prior to enclosing the space.
2. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate conditions that could affect final finishing.
3. Terminate closed chutes into appropriate containers with lids. Open free-fall chutes are not permitted.
4. Provide on-site dump containers for collection of waste materials, rubbish and debris.
5. Do not allow waste materials, rubbish and debris to accumulate and become an unsightly and hazardous condition. Provide additional collection and dispose of debris whenever periodic schedule is inadequate to prevent accumulation.
6. At not less than every week during progress of Work, clean up site and access, and legally dispose of waste materials, rubbish, and debris away from site.
7. Do not overload trucks to prevent spillage on access and haul routes. Periodically examine traffic areas and maintain clear routes.

3.2 DUST CONTROL

- A. Sprinkle dusty debris with water.
- B. Vacuum clean interior building areas, including floors, ledges, pipes, ducts, and other places where dust can accumulate, in conjunction with gypsum board installation and sanding operations, and when ready to receive finish painting.
- C. Continue vacuum cleaning on an as-needed basis until building is ready for acceptance or occupancy.
- D. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet and newly painted surfaces.
- E. Clean floors prior to installation of final floor coverings.

3.3 DISPOSAL

- A. Remove waste materials, debris, and rubbish from site daily and dispose off-site.
- B. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary sewer. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly.
- C. Do not hold materials more than 7 days during normal weather or 3 days when temperature is expected to rise above 80 degrees F.
- D. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in lawful manner.
- E. Do not dispose of wastes into streams or waterways. Do not burn or bury rubbish and waste material on Project site.

F. Disposal of waste in Owner's containers on site is not permitted.

END OF SECTION

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SECTION 01 74 23

FINAL CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for final cleaning at Substantial Completion.

1.2 PROJECT CONDITIONS

- A. Environmental Requirements: Conduct cleaning and waste disposal operations in full compliance with federal and local environmental and anti-pollution regulations, ordinances and laws.
- B. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
- C. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING AT SUBSTANTIAL COMPLETION

- A. General:
 - 1. Complying with manufacturer's instructions clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program using experienced workers or professional cleaners.

2. Complete cleaning operations and conduct an examination of Work areas with Owner and Architect before requesting inspection for Certification of Substantial Completion for the entire Project or a portion of the Project.
- B. Remove grease, petro-chemical spills, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight exposed interior and exterior surfaces.
 - C. Remove debris and surface dust from limited access spaces, including plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
 - D. Broom clean concrete floors in unoccupied spaces.
 - E. Wash and shine glazing and mirrors.
 - F. Remove labels that are not permanent labels.
 - G. Clean plumbing fixtures to a sanitary condition, free of stains.
 - H. Polish glossy surfaces to a clear shine.
 - I. Clean resilient flooring, paver flooring, ceramic tile flooring, and carpeting as recommended by manufacturers.
 - J. Repair, patch and touch up marred surfaces to match adjacent surfaces. Replace broken or scratched glass.
 - K. Broom clean exterior paved surfaces; rake clean other surfaces of grounds.
 - L. Heating, Ventilating, and Air Conditioning Systems:
 1. Clean permanent filters and replace disposable filters if units were operated during construction.
 2. Clean exposed surfaces of diffusers, registers and grills.
 3. Clean ducts, blowers, and coils if units were operated without filters during construction.
 4. Clean exposed ductwork after other cleaning has been completed.
 - M. Clean light fixtures, lamps, gloves, reflectors and replace burned out bulbs and defective starters.
 - N. Clean food service equipment to a sanitary condition, ready and acceptable for its intended use.
 - O. Clean roof areas of debris; flush roof drainage system with water until clear.
 - P. Leave Project clean and ready for occupancy.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for project closeout, including but not limited to:
1. Substantial Completion.
 2. Inspection procedures.
 3. Closeout submittals.
 4. Payments and release of liens.
 5. Post construction examinations.

1.2 SUBSTANTIAL COMPLETION

- A. When Contractor considers Work is substantially complete, submit to Architect:
1. Written certification that Work, or designated portion thereof, is substantially complete.
 2. List of items to be completed or corrected, value of incomplete construction and reasons the Work is not complete.
- B. Within seven calendar days after receipt of such certificate, Architect will make examination to determine status of completion.
- C. Should Architect determine that Work is not substantially complete:
1. Architect will promptly notify Contractor in writing, giving reasons.
 2. Contractor shall remedy deficiencies in Work, and send second written notice of substantial completion to Architect.
 3. Architect will re-examine Work.
- D. When Architect concurs that Work is substantially complete, he will:
1. Prepare Certificate of Substantial Completion on AIA Form G704, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by Architect.
 2. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
- E. After Work is substantially complete, Contractor shall:
1. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.

2. Obtain and submit Certificate of Occupancy, operating certificates and similar releases enabling the Owner unrestricted use of the Work.
3. Complete work listed for completion or correction within designated form.
4. Advise Owner of pending insurance change-over requirements.
5. Perform final cleaning in accordance with 01 74 23.
6. Make final change-over of permanent locks and transmit keys to Owner.

1.3 FINAL INSPECTION

- A. When Contractor considers Work is complete, submit written certification that:
 1. Contract Documents have been reviewed.
 2. Work has been examined for compliance and completed in accordance with Contract Documents.
 3. Equipment and systems have been tested in presence of Owner's representative and are operational.
 4. Work is completed and ready for final examination.
- B. Architect will make examination to verify status of completion within seven calendar days after receipt of such certification.
- C. Should Architect consider that Work is incomplete or defective:
 1. Architect will promptly notify Contractor in writing, listing incomplete or defective work.
 2. Contractor shall take immediate steps to remedy stated deficiencies, and send second written certification to Architect that Work is complete.
 3. Architect will re-examine Work.
- D. When Architect finds that Work is acceptable under Contract Documents, he shall request Contractor to make closeout submittals.

1.4 REINSPECTION FEES

- A. Should Architect perform re-examinations due to failure of Work to comply with claims of status of completion made by Contractor:
 1. Owner will compensate Architect for such additional services.
 2. Owner will deduct amount of such compensation from final payment to Contractor.

1.5 CLOSEOUT SUBMITTALS

- A. Evidence of compliance with requirements of governing authorities:
 1. Certificate of Occupancy.
 2. Certificates of Inspection: Mechanical and Electrical systems as required by respective sections.

- B. Project Record Documents: Comply with Section 01 78 39.
- C. Operating and Maintenance Data: Comply with Section 01 78 23.
- D. Warranties and Bonds: Comply with Section 01 78 30.
- E. Spare Parts and Maintenance Material:
 - 1. Provide products, spare parts, and maintenance materials in quantities specified in each specification section in addition to that required for completion of Work.
 - 2. Coordinate with Owner, deliver to Project site, store properly, and obtain receipt prior to final payment.
- F. Certificate of Insurance for Products and Completed Operations.

1.6 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

- A. Contractor's Affidavit of Payment of Debts and Claims: AIA G706.
- B. Contractor's Affidavit of Release of Liens: AIA G706A.
- C. Attachment to Contractor's Affidavit of Release of Liens:
 - 1. Consent of Surety to Final Payment: AIA G707.
 - 2. Contractor's Release or Waiver of Liens.
 - 3. Separate releases of waivers of liens from subcontractors, suppliers and others with lien rights against property of Owner, together with list of those parties.
- D. Submittals shall be duly executed before delivery to Owner.

1.7 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit final statement of accounting to Architect.
- B. Statement shall reflect adjustments to Contract Sum:
 - 1. Original Contract Sum.
 - 2. Additions and deductions resulting from:
 - 3. Previous Change Orders.
 - 4. Allowances.
 - 5. Unit Prices.
 - 6. Deductions for uncorrected Work.
 - 7. Penalties and Bonuses.
 - 8. Deductions for liquidated damages.
 - 9. Deductions for re-examination payments.
 - 10. Other adjustments.
 - 11. Total Contract Sum, as adjusted.
 - 12. Previous payments.
 - 13. Sum remaining due.

- C. Architect will prepare final Change Order, reflecting approved adjustments to Contract Sum which were not previously made by Change Orders.

1.8 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit final Application for Payment in accordance with procedures and requirements stated in Conditions of the Contract.

1.9 ADDITIONAL ADJUSTMENT

- A. No adjustments to Contract requested by Contractor will be allowed if asserted after execution of Final Payment of Contract.

1.10 POST-CONSTRUCTION EXAMINATION

- A. Prior to expiration of one year from Date of Substantial Completion, Owner will make visual examination of Project in company of Contractor to determine whether further correction of Work is required in accordance with provisions of Contract.
- B. Owner will promptly notify Contractor, in writing, of observed deficiencies.
- C. Contractor will contact Owner to arrange time and establish schedule for correction of deficiencies.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements the preparation and submittal for operating and maintenance manuals including the following:
 - 1. Operating and maintenance manuals for building systems or equipment.
 - 2. Instruction manual covering the care, preservation and maintenance of architectural products and finishes.
 - 3. Instruction of Owner's operating personnel in operation and maintenance of building systems and equipment.

1.2 FORM OF SUBMITTALS

- A. Prepare instructional manuals and data bound in commercial quality 3-ring binders:
 - 1. Organize with index tabs according to sequence of Specification Sections.
 - 2. Identify each volume with type or printed title as instructed by Architect.

1.3 CONTENT OF MANUALS

- A. Arrange typewritten table of contents for each volume, in systematic order:
 - 1. List of each product required to be included with name, address, and telephone number of:
 - a. Subcontractor or installer.
 - b. Maintenance contractor, as appropriate.
 - c. Local source of supply for parts and replacement.
 - 2. Identifying each product by product name and other identifying symbols.
- B. Product Data:
 - 1. Include only those sheets which are pertinent to specific product with product clearly identified.
 - 2. Delete references to inapplicable information.
 - 3. Annotate each sheet to clearly identify specific product or part installed, and data applicable to installation.
- C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems and control and flow diagrams.
 2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
- D. Written Text: As required to supplement product data for particular installation to provide logical sequence of instructions for each procedure, organized in a consistent format and in logical sequence of instructions for each procedure.
- E. Recommended Spare Parts: Furnish a list of recommended spare parts for each equipment item that will be needed to support that item of equipment for a 12 month period. Spare parts list shall contain the following information:
1. Parts Descriptions.
 2. Manufacturer's Part Number.
 3. Shelf Life.
 4. Recommended Quantity.
 5. Unit Price.
 6. Name and address of the part manufacturer.
 7. Name and address of a local supplier for the part.

1.4 EQUIPMENT AND SYSTEMS MANUAL REQUIREMENTS

- A. Submit three copies of completed manuals in final form.
- B. Content, for each unit of equipment and system, as appropriate:
1. Description of unit and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Operating procedures:
 - a. Start-up, break-in, routine and normal operating instructions.
 - b. Regulation, control, stopping, shutdown and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.
 3. Maintenance Procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Alignment, adjusting and checking.
 4. Servicing and lubrication schedule, including list of lubricants required.
 5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.
 7. Original manufacturer's parts list, price lists, illustrations, assembly drawings and diagrams required for maintenance, predicted life of parts subject to wear and items recommended to be stocked as spare parts.
 8. As-installed control diagrams by controls manufacturer.
 9. Each subcontractor's coordination drawings including as-installed color coded piping diagrams.
 10. Charts of valve tag numbers, with location and function of each valve.
 11. Water treatment procedures and tests.
 12. Final balancing reports for mechanical systems.
 13. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 14. Other data as required under pertinent sections of specifications.
- C. Content, for each electric and electronic system, as appropriate:
1. Description of system and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Circuit directories of panelboards.
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
 3. As-installed color coded wiring diagrams.
 4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
 5. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Adjustment and checking.
 6. Manufacturer's printed operating and maintenance instructions.
 7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 8. Other data as required under pertinent sections of specifications.
- D. Include warnings of detrimental maintenance practices.
- E. Prepare and include additional data when need for such data becomes apparent during instruction of Owner's personnel or as required under pertinent Specification Section.

- F. Refer to individual Sections of Project Manual for additional requirements for operating and maintenance data.
- G. Provide complete information for products and equipment specified in:
 - 1. Division 21: Fire Suppression
 - 2. Division 22: Plumbing
 - 3. Division 23: Heating, Ventilating, and Air-Conditioning (HVAC)
 - 4. Division 26: Electrical Systems.
 - 5. Division 27: Communications
 - 6. Division 28: Electronic Safety and Security

1.5 ARCHITECTURAL PRODUCTS MANUAL REQUIREMENTS

- A. Submit three copies of complete manual in final form.
- B. Refer to individual Sections of Project Manual for submittal requirements.
- C. Content: Manufacturer's data, giving full information on products, catalog numbers, sizes, and composition; and finish designations.
- D. Information required for re-ordering.
- E. Instructions for care and maintenance.
 - 1. Manufacturer's recommended lubricants.
 - 2. Manufacturer's recommendations for types of cleaning agents and methods.
 - 3. Cautions against cleaning agents and methods which are detrimental to product.
 - 4. Recommended maintenance and cleaning schedule.
- F. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

1.6 ARCHITECTURAL FINISHES MANUAL REQUIREMENTS

- A. Submit three copies of complete manual in final form.
- B. Contractor is to provide finish information and samples of actual materials installed in Project. Provide separate line item for each type of finish installed. Attach small sample of each finish that matches finish installed. Provide information on manufacturer, catalog number, finish designation, or other information necessary for Owner to match finish in the future.
- C. Refer to individual Sections of Project Manual for submittal requirements.
- D. Contractor will provide heavy, cardboard pages printed in required page format, approved by Architect, to attach samples and information to for assembly into notebook format.

- E. Contractor shall compile information and samples for Manual on Architectural Finishes throughout construction period to simplify assembly at Project close-out.

1.7 SUBMITTAL SCHEDULE

- A. Submit one copy of completed data in final form 30 days prior to demonstrations of equipment.
- B. Copy will be returned approved or with comments for revisions.
- C. Submit specified number of copies of approved data in final form within 10 days prior to equipment demonstrations and prior to final inspection or acceptance.

1.8 INSTRUCTIONS OF OWNER'S PERSONNEL

- A. Prior to final inspection, instruct the Owner's personnel in operation, adjustment, and maintenance of products equipment and systems. Provide instruction at mutually agreed upon times.
 - 1. For equipment that requires seasonal operation, provide similar instruction during other seasons.
 - 2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain aspects of operation and maintenance.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

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SECTION 01 78 30

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: General administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Compile specified warranties and bonds.
 - 2. Compile specified service and maintenance contracts.
 - 3. Co-execute submittals when so specified.
 - 4. Review submittals to verify compliance with Contract Documents.
 - 5. Submit to Architect for review and transmittal to Owner.

1.2 DEFINITIONS

- A. Standard Product Warranties: Reprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties: Written warranties required by the Contract Documents, either to extend time limits provided standard product warranties or to provide greater rights for the Owner.
- C. Emergency Repairs: Owner reserves right to make emergency repairs as required to keep equipment or materials in operation or to prevent damage to persons or property without voiding Contractor's warranty or bond, or relieving Contractor of his responsibilities during contract, warranty or bond periods.

1.3 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
 - 1. Reinstatement of Warranty: When Work covered by a warranty by written endorsement.
- B. Reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation but not less than 50% of the original warranty period of time.

- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents.
 - 1. Cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through its anticipated useful service life is the Contractor's responsibility.
- D. Rejection of Warranties: Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. Acceptance of Work: Owner reserves the right to refuse to accept Work for the Project where a special warranty is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds, service contracts and maintenance contracts, executed by each of respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence and provide complete information for each item.
 - 1. Product or work item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning of each warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service maintenance contract.
 - 6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect validity of warranty or bond.
 - 7. Contractor, name of responsible principal, address and telephone number.

1.5 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2" x 11", punch sheets for standard 3-ring binder.
 - 2. Fold larger sheets to fit into binders.
 - 3. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS".
 - 4. List:

- a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, 3-ring, with durable and cleanable plastic covers.

1.6 TIME OF SUBMITTALS

- A. Submit warranties to Architect prior to date certified for Substantial Completion or on date specified in Architect Certificate of Substantial Completion:
- 1. When a designated portion of the Work is completed and occupied or used by the Owner submit properly executed warranties to Architect within fifteen days of completion of that designated portion of the Work.
 - 2. For items of work, where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.7 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, service contracts and maintenance contracts as specified in each respective Specification Section.
- B. Refer to each individual Section of Project Manual for specific warranty and bond submittal requirements.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

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SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for Project Record Documents including but not limited to the following:
 - 1. Marked-up copies of Contract Documents including field records for variable and concealed conditions.
 - 2. Marked-up copies of submittals, shop drawings, product data, and samples.
 - 3. Newly prepared drawings.

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. For duration of Project, maintain at job site following:
 - 1. One copy of Drawings, Specifications, Addenda, shop drawings, product data, miscellaneous requested submittal data, change orders and other modifications to Contract, field orders, field tests or written instructions.
 - 2. One copy of transmittal letters.
 - 3. One set of samples.
- B. Store documents and samples in Contractor's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
 - 3. Do not permit record documents to be used for construction purposes.
- C. File documents and samples in accordance with CSI MasterFormat 2014.
- D. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- E. Make documents and samples available for examination by Architect.
- F. Incomplete or out of order documents and samples will be grounds for not approving application for payment.
- G. Provide felt tip marking pens for recording information in color code designated by Architect.

- H. Label each document "PROJECT RECORD" in neat large printed letters. Keep record documents current. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
 - 1. Prior to creation of electronic copies of record documents, remove Architect's and Engineer's seals from all documents as directed by the Architect.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal: Submit one paper copy set of marked-up record prints. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal: Submit PDF electronic files of marked-up record prints. Print each Drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

1.4 BURDEN OF ACCURACY

- A. Contractor shall bear costs of damages incurred by Owner due to inaccuracies or incompleteness of submitted Record Documents for a period of time following Substantial Completion as defined by Conditions of the Contract.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Formats:
 - a. Annotated PDF electronic file with comment function enabled.

2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. Refer to Section 01 31 00 "Project Coordination" for requirements related to use of Architect's digital data files.
- C. 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.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. 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.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Format: Annotated PDF electronic file with comment function enabled.
 2. 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.
 3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

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

- B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

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

2.4 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION

3.1 RECORDING

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to the Documents as they occur. Do not wait until the end of the project. Architect will periodically review record documents to assure compliance.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from

deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours

END OF SECTION

SECTION 01 78 46

EXTRA MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for stocking of extra material.
- B. Divisions 2 - 41: Specific quantities of extra material required by individual specifications sections.

1.2 PRODUCTS REQUIRED

- A. Provide quantities of extra materials specified in individual specification sections to Owner, in addition to quantities required for completion of Work.
- B. Products to be identical to those installed in Work. Include quantities in original purchase from supplier or manufacturer to avoid variations in manufacture.

1.3 STORAGE AND MAINTENANCE

- A. Temporarily store extra materials with products to be installed in Work, under provision of Section 01 60 00, or in other location acceptable to Owner.
- B. When adequate, secure storage facilities available at Site, capable of maintaining conditions required for storage and not required for Contract Work or storage; extra materials may be stored in available space.
- C. Maintain extra materials in manufacturer's unopened original containers with labels intact and legible, until delivery to Owner.

1.4 DELIVERY

- A. Coordinate final delivery of extra materials with Owner prior to Substantial Completion.
- B. Deliver, unload, store, and account for specified quantities of extra materials in presence of Owner's representative.
- C. Owner will indicate final placement in building of extra materials.
- D. Obtain written acceptance from Owner's representative of receipt of specified quantities of extra materials.

- E. For portions of Work accepted and occupied by Owner prior to Substantial Completion, deliver proportional quantity of spare parts and maintenance materials if requested by Owner. Record quantities delivered with Owner's representative.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 79 00

SYSTEM DEMONSTRATIONS AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SUBMITTALS

- A. Instruction Program: Prior to the execution of any demonstrations or training, submit outline of instructional program, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1.3 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, experienced in operation and maintenance procedures and training.
- B. Preinstruction Conference: Conduct conference at Project site with Owner's personnel. Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.

5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.

7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.

8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

SECTION 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. The purpose of the Commissioning Process is to provide the Owner/Operator of the facility with independent verification that the systems to be commissioned have been installed according to the contract documents and operate within the performance guidelines set in the Owner's Project Requirements, the Basis of Design, the construction drawings and these specifications. The Commissioning Authority will provide the Owner with independent, unbiased, objective view of the system's installation, operation and performance. The commissioning process does not alleviate or reduce the responsibility of the design professionals or installing contractors to provide a complete and finished product, installed and fully functional in accordance with the contract documents.
- B. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems for use by the Owner. Quality commissioning requires participation by all parties involved with the design and construction process, including the owner, architect and engineer, general and sub-contractors, and owner's facilities department. The Telios will lead the commissioning team planning and coordinating all commissioning activities.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Owner's Project Requirements.
- C. Basis of Design
- D. Contractor and Vendor field start-up reports.
- E. Contractor QA/QC Testing reports.
- F. Close-out documentation including O&M Manuals.
- G. Related Sections:
 - 3. Section 01 31 00 "Project Management and Coordination"
 - 4. Section 01 32 00 "Construction Progress Documentation"
 - 5. Section 01 33 00 "Submittal Process"
 - 6. Section 01 77 00 "Closeout Procedures"
 - 7. Section 01 78 23 "Operations and Maintenance Data"

8. Division 22 – “Plumbing”
9. Division 23 – “Heating Ventilating and Air Conditioning”
10. Division 26 – “Electrical”

1.3 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

1.4 DEFINITIONS

- A. Basis of Design (BoD): A document that records concepts, calculations, decisions, and product selections used to meet the Owner’s Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and other collections of data that support the design process.
- B. Commissioning Process:
 1. A quality-focused process for enhancing the delivery of a project. The Process focuses on verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner’s Project Requirements.
 2. Commissioning is typically abbreviated by “Cx”. Commissioning and Cx have the exact same meaning and will be used interchangeably throughout the Contract Documents.
- C. Commissioning Plan: A document that outlines the organization, communication, roles and responsibilities, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is binding for included contractors. When in conflict with this specification section, the specification of this section shall take precedence over the Commissioning Plan.
- D. Commissioning Authority (CxA): An entity identified by the Owner who plans, schedules and coordinates the Commissioning Team to implement the Commissioning Process. This is often abbreviated as Cx Authority or CxA. In the case of this project Telios, TTG and/or C1S Group may be referred to as the CxA. The roles and responsibilities of each firm contracted to perform commissioning services has been further defined in the Commissioning Plan.
- E. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- F. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

- G. Commissioning Team: The individuals who, through coordinated actions, are responsible for implementing the Commissioning Process.
- H. Contractor QA/QC Test Reports: The reports generated through the Construction Phase as required by the specifications for QA/QC activities by the installing contractors including megger tests, piping and duct pressurization testing. These reports are to be copied to the Cx Authority for review as part of the completed Pre-functional Checklists.
- I. Corrective Issue Report: A report generated by the Cx Authority during Functional Performance and Integrated Systems Testing documenting issues found during the testing procedures that require follow-up corrective action.
- J. Deferred or Seasonal Testing: Functional performance and integrated systems testing that is performed after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the testing from being performed during the Testing Phase.
- K. Deficiency: A condition in the installation or function of a component, piece of requirement or system that is not in compliance with the Contract Documents (i.e. does not perform properly or is not complying with the design intent/basis of design).
- L. Final Commissioning Report: A report prepared by the Cx Authority which includes information from the complete Commissioning Process as defined throughout the Commissioning Plan and will include completed Functional Performance and Integrated Systems Test and the resolved Corrective Issues Report. This report will be provided to the Owner at the completion of the project.
- M. Functional Performance and Integrated Systems Testing: Testing of the dynamic functional and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional performance and integrated systems testing is the dynamic testing of systems (rather than just components) under full operation. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied modes, varying outside ambient conditions, fire alarm, power failure, etc. The systems are operated through all control systems sequences of operation and components are verified to be responding according the documented sequences of operation.
 - 1. The Commissioning Authority develops the functional performance and integrated systems test procedures in a sequential written form, coordinates, witnesses, and documents the actual testing, which is performed by the installing contractor or vendor.
 - 2. Functional performance and integrated systems testing are performed after completion of the pre-functional checklists and any factory/manufacturer start-up procedures.
- N. Pre-Functional Checklist: Documents prepared by the Cx Authority and issued to the Contractor early in the Construction Phase. The purpose of the Checklists are to verify that appropriate components are on site, correctly installed, started, operational, and ready for functional performance and integrated systems testing. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation.

1. Pre-functional checklists augment and are combined with the manufacturer's start-up checklists and contractor QA/QC Test Reports but are not a substitute.
- O. Sampling: Functional performance and/or integrated systems testing of only a fraction of the total number of identical or near identical pieces of equipment or systems.

1.5 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 2. Representatives of the facility user and operation and maintenance personnel.
 3. Architect and engineering design professionals.

1.6 OWNER'S RESPONSIBILITIES OVERVIEW

- A. Work with the Architect and/or Engineer to provide the OPR documentation to the CxA for review.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for review and use in developing the Commissioning Plan.
- D. See Part 3 of this specification section for a more detailed breakdown of commissioning "ROLES AND RESPONSIBILITIES"

1.7 CONTRACTOR'S RESPONSIBILITIES OVERVIEW

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 2. Cooperate with the CxA for resolution of issues recorded in the Corrective Issues Log.
 3. Attend commissioning team meetings held on a regular basis.

4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the CxA.
6. Complete construction checklists as work is completed and provide to the Commissioning Authority on a regular basis.
7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
8. Operate installed equipment to complete commissioning process test procedures.
9. Provide necessary equipment and instrumentation to complete commissioning test procedures.
10. The electrical contractor shall operate electrical breakers and electrical distribution gear required to execute commissioning tests, as directed by the CxA.
11. The mechanical contractor shall operate hydronic, HVAC and plumbing equipment required to execute commissioning tests, as directed by the CxA.
12. The mechanical contractor shall provide all duct pressure, piping pressure, cleaning and additional QA/QC checks completed along with confirmation that all noted issues have been addresses.
13. Contractors shall provide all specialty equipment and access equipment (ladders, lifts, catwalks, etc.) necessary to complete testing and inspection during the construction phase as well as the 10th month warranty review.
14. The Test and Balance contractor shall assist in a sampling of Test and Balance verification checks as well as aid in investigating deficiencies discovered through the commissioning process.
15. The controls contractor shall operate and adjust the building automation system as required for the successful completion of commissioning activities.
16. Contractors shall provide the commissioning team with copies of all submittals of commissioning related items for use in developing Pre-Functional Checklists and Functional Performance Tests
17. Contractors shall maintain up-to date as-built documentation for their specific trade.
18. Contractors shall provide, upon approved submittals, thorough operations and maintenance data for use by the commissioning team.
19. The contractors shall provide owner training for commissioned equipment installed within the new facility.
20. Contractor's representatives shall participate in the 10th month warranty review of the facilities.

- B. See Part 3 of this specification section for a more detailed breakdown of commissioning "ROLES AND RESPONSIBILITIES"

1.8 CxA'S RESPONSIBILITIES OVERVIEW

- A. Organize and lead the commissioning team.
- B. Conduct commissioning reviews of the Basis of Design, Owners Project Requirements, Drawings and Specification.
- C. Provide commissioning plan.

- D. Convene commissioning team meetings.
- E. Conduct periodic site inspections and report any items requiring contractor attention/remediation.
- F. Provide Project-specific construction checklists and functional performance test procedures.
- G. Verify the execution of commissioning process activities using representative sampling. Verification will include, but is not limited to, construction checklists (no sampling permitted), operating and maintenance data, functional performance tests, and test reports to verify compliance with the OPR.
- H. Prepare and maintain the Corrective Issues Log.
- I. Prepare and maintain completed construction checklist log.
- J. Provide testing procedures and performance criteria for the following equipment.
 - 1. Mechanical Equipment
 - a. All Air Distribution Systems and Equipment
 - b. All Cooling Systems and Equipment
 - c. All Heating Systems and Equipment
 - d. Stand-alone/Packaged HVAC Controls Devices and Sensors
 - e. Central Building Automation System Control Devices and Sensors
 - 2. Plumbing Systems
 - a. Domestic Water Pumping and Distribution Systems
 - b. Water Heaters
 - 3. Electrical/Lighting Systems
 - a. Daylighting/Photocell Controls
 - b. Dimming Controls
 - c. Occupancy Controls
 - d. Generator & UPS's
- K. See Part 3 of this specification section for a more detailed breakdown of commissioning "ROLES AND RESPONSIBILITIES"

PART 2 - PRODUCTS

2.1 FUNCTIONAL PERFORMANCE AND INTEGRATED SYSTEMS TESTING EQUIPMENT AND INSTRUMENTS

- A. Contractor shall provide all tools, instruments, tablet/laptop computers, software programs and services required to perform system functional performance and integrated systems testing procedures. This includes providing the connection to systems to be tested, operation of the test equipment and instrumentation and generating test results as required.
- B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system and equipment performance within the tolerances specified in the Contract

Documents and the functional performance or integrated systems test procedures. If not otherwise noted, the following minimum requirements shall apply:

1. Temperature sensors and digital thermometers shall have an accuracy of 1.0°F and a resolution of $\pm 0.1^\circ\text{F}$.
 2. Pressure sensors shall have an accuracy of $\pm 2.0\%$ of the value range being measured (not full range of meter).
 3. Humidity sensors shall have an accuracy of $\pm 5.0\%$ of the value range being measured (not full range of meter).
 4. Carbon dioxide monitoring equipment shall have an accuracy of $\pm 10.0\%$ of the design airflow value.
 5. Air flow monitoring equipment shall have an accuracy of $\pm 10.0\%$ of the design airflow value.
 6. Hydronic balancing meter (water flow, differential pressure, gauge pressure) shall have an accuracy of $\pm 2.0\%$ of the full range of the meter.
 7. Refrigerant monitoring and detection devices.
 8. Digital multimeter/voltmeter and clamp-style current sensor shall have an accuracy of $\pm 1.0\%$ of the full range of the meter.
- C. All testing equipment shall have calibration certificates readily available for review and documentation and shall have been calibrated within the previous 12 months.

2.2 OPERATIONS & MAINTENANCE MANUALS

- A. Contractor shall provide all Operation & Maintenance Manual material identified in Section 01 77 00, Section 01 78 23 and related Sections to the Owner, Design Team and Cx Authority in electronic format. Information should be provided in PDF format or formats compatible with Microsoft Office applications for PCs. Refer to submittal requirements established in Divisions 01, 22, 23 and 26 for additional requirements.
- B. Installation and checkout materials that are shipped attached to or inside equipment and the actual field checkout sheet forms used by the factory or field technicians shall be submitted to the Commissioning Authority. All documentation requested by the Commissioning Authority will be included by the Contractors in their O&M manuals.

PART 3 - EXECUTION

3.1 ROLES AND RESPONSIBILITIES

- A. Design Phase
1. Owner (Provided for information only):
 - a. Provide input and commitment to the contractor's project requirements for the project.
 - b. Review and approve the Commissioning Plan.
 - c. Accept the Basis of Design and Owner's Project Requirements based upon recommendation from the design team and consultants.
 2. Design Team (Provided for information only):
 - a. Review the Commissioning Plan
 - b. Complete and submit the Basis of Design document.
 - c. Assist the owner in completing the Owner's Project Requirements.
 - d. Prepare contract documents integrating commissioning process requirements.

- e. Respond to the commissioning team design review comments and other issues in a timely manner.
 - 3. Commissioning Authority (Provided for information only):
 - a. Develop the Commissioning Plan for the project.
 - b. Develop the Commissioning Specification and associated specification section inserts for coordination.
 - c. Review and provide comments on the Basis of Design and Owner's Project Requirements.
 - d. Develop the initial format to be used for the Corrective Issues Report to be used throughout the remaining phases of the project.
 - e. Provide a commissioning-focused design review of the contract documents prior to the Issued for Permit set, with a back-check at the 100% Construction Documents.
 - 4. Construction Manager
 - a. Include commissioning process requirements into all applicable sub-contractor's scope and contracts.
- B. Construction Phase
- 1. Owner (Provided for information only):
 - a. Attend Commissioning coordination meetings.
 - b. Review and approve the O&M manuals concurrent with review by the Design Team and the Commissioning Authority.
 - c. Review and approve Construction Phase Commissioning documentation.
 - 2. Facility O&M Personnel (Provided for information only):
 - a. Attend Commissioning coordination meetings.
 - b. Periodically visit the construction site to become familiar with the components as they are installed and prior to being concealed.
 - c. Witness, to the greatest extent desired, equipment cleaning, testing, and startup procedures.
 - d. Witness, to the greatest extent desired, pre-wall and ceiling close-up inspections.
 - e. Communicate with the Construction Manager and Cx Authority any concerns regarding system installation.
 - 3. Design Team (Provided for information only):
 - a. Attend Commissioning coordination meetings.
 - b. Provide the Cx Authority with copies of each answered RFI, ASIs, ECNs, Change-Orders and meeting minutes.
 - c. Collaborate with the Cx Authority to develop the final detailed Functional Performance and Integrated Systems Test Procedures for control/building automation systems, based on the system shop drawings and submittals.
 - d. Provide any design narratives and sequences documentation required by the Commissioning Authority. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
 - e. Review and approve the O&M manuals concurrent with review by the Cx Authority and the Owner.
 - f. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals.
 - 4. Commissioning Authority (Provided for information only):

- a. Conduct a Commissioning Team Kickoff meeting. The intent of the meeting will be to present the commissioning specification requirements, test procedures, and scheduling.
 - b. Lead and document Commissioning coordination meetings.
 - c. Randomly sample the completion of the Pre-Functional Checklists.
 - d. Review and comment on any changes to the Basis of Design document prepared by the Design Team.
 - e. Assist the Construction Manager, sub-contractors, and Owner's Project Manager in incorporating Commissioning activities into the master project schedule.
 - f. Review O&M manuals applicable to systems to be commissioned concurrent with the Design Team's review. Submit review comments to the project team in coordination with the Design Team's review.
 - g. Review additional Construction Phase documentation, ASIs, RFIs, Change Orders, Meeting Minutes, and other correspondence required to plan and perform commissioning tasks.
 - h. Perform site visits, in conjunction with Commissioning meetings, to observe component and system installations. Attend selected planning and job site meetings to obtain information on construction progress.
 - i. Review TAB execution plan developed by the construction team.
 - j. Coordinate selected witnessing of systems/equipment cleaning, QA/QC testing, and startup procedures (as specified in Division 04 - 08, 22, 23, 25, and 26) with the Construction Manager.
 - k. Prepare final Functional Performance and Integrated Systems Test Procedures reflective of the approved equipment/system shop drawings and the final Basis of Design. These will be distributed to the Owner, Design Team, and Construction Manager for distribution to all affected contractors for their review, comment, and approval.
5. Construction Manager:
- a. Review Construction Phase Commissioning documentation including but not limited to Cx site observation reports and Pre-Functional Checklists.
 - b. Participate in Commissioning coordination meetings.
 - c. Copy all Meeting Minutes to the Commissioning Authority for informational purposes.
 - d. Incorporate Commissioning activities into the master project schedule. This scheduling shall involve the Cx Authority and installation contractors. Provide the Cx Authority with schedule updates at least monthly.
 - e. Consolidate and manage the systems/equipment O&M manual preparation process by the installation contractors. Submit the systems/equipment O&M manuals to the Cx Authority for review and inclusion in the Cx close out documentation prior to submission of completed Pre-Functional Checklists.
 - f. Schedule and witness equipment and systems cleaning, QA/QC testing, and start-up procedures (as specified in Division 22, 23, 25, and 26). Submit documentation for review by the Owner, Design Team and Cx Authority.
 - g. Coordinate completion of the Pre-Functional Checklists by the appropriate sub-contractor as the work is accomplished. Submit the completed Pre-Functional Checklists to the Cx Authority prior to certifying systems are ready for Functional Performance and Integrated Systems Testing.

- h. Update the Cx Authority with any construction changes to the systems being commissioned including copies of all relevant Requests for Information and Change Orders.
 - i. Collaborate with the Design Team and Cx Authority to develop the final detailed Functional Performance and Integrated Systems Test Procedures for control/building automation systems, based on the system shop drawings and submittals.
 - j. Review and provide oversight on the completion of the Pre-functional Checklists. The construction manager shall be responsible for any delays due to incomplete or improperly completed pre-functional documentation will be the. Deferred or delayed testing due to insufficient or improper pre-functional documentation shall be completed at the expense of the construction manager or appropriate installing contractor.
6. Sub-Contractors:
- a. Review and provide input to Construction Phase Commissioning documentation.
 - b. Participate in Commissioning coordination meetings.
 - c. Complete the Pre-Functional Checklists as the work is accomplished and submit to the Construction Manager prior to the start of the Functional Performance and Integrated Systems Testing.
 - d. Collaborate with the Design Team and Commissioning Authority to develop the final detailed Functional Performance and Integrated Systems Test Procedures for systems to be commissioned.
- C. Testing and Phase
1. Owner (Provided for information only):
 - a. Review and comment on resolutions of the Corrective Issues Report.
 2. Facility O&M Personnel (Provided for information only):
 - a. Witness, to the greatest extent desired, the Functional Performance and Integrated Systems Tests executed by the contractors and overseen by the Commissioning Authority.
 - b. Participate in O&M system training sessions.
 - c. Review and approve the O&M manuals concurrent with review by the Design Team and the Commissioning Authority.
 3. Design Team (Provided for information only):
 - a. Participate in Owner training as detailed in the training program.
 - b. Review systems/equipment cleaning, QA/QC testing, and start-up reports submitted by the contractor.
 - c. Review and comment on the Commissioning Authority's Corrective Issues reports.
 4. Commissioning Authority (Provided for information only):
 - a. Review systems/equipment cleaning, QA/QC testing, and start-up reports submitted by the contractor.
 - b. Witness system and assembly Functional Performance and Integrated Systems Testing. List any deficiencies on systems in the Corrective Issues Report and provide to the Owner, Design Team, and contractors for review and corrections. Include completed Functional Performance and Integrated Systems Test Procedures within the Final Cx Report.

- c. Coordinate the completion of required building envelope testing per prescriptive test standards with the Construction Manager and responsible subcontractors.
 - d. Communicate requirements for retesting failed systems and equipment.
 - e. Attend roof final inspection.
5. Construction Manager:
- a. Submit completed Pre-Functional Checklists and appropriate systems/equipment cleaning, QA/QC testing, start-up and balance reports to the Commissioning Authority prior to certifying systems to be commissioned are ready for Functional Performance and Integrated Systems Testing. Provide this certification to the Commissioning Authority in writing with copy to the Owner and the Design Team.
 - b. Coordinate all subcontractor participation and provide any required equipment necessary for Functional Performance and Integrated Systems Testing. Equipment required for testing shall have valid calibration certificates.
 - c. Remedy deficiencies identified by the Cx Authority during Functional Performance and Integrated Systems Testing and noted within the Corrective Issues Report.
 - d. Coordinate scheduling of the systems and component training sessions with the installation subcontractors for the convenience of the trainees.
 - e. Submit equipment spare parts to Facility O&M Personnel as detailed in the Contract Documents.
6. Sub-Contractors:
- a. Demonstrate the performance of assemblies and/or operation of systems to the Cx Authority as required in order to achieve the requirements of the Functional Performance and Integrated Systems Test Procedures.
 - b. Correct all deficiencies identified by the Commissioning Team and noted within the Corrective Issues Report.
 - c. Implement the training program as detailed in the Contract Documents and documented in the Training Forms.
- D. Warranty Phase
- 1. Owner (Provided for information only):
 - a. Attend 10th month warranty review meeting.
 - b. Review and comment on the Final Commissioning Report.
 - 2. Facility O&M Personnel (Provided for information only):
 - a. Maintain records of issues or concerns associated with the systems during normal operation for review at 10th month warranty review meeting.
 - b. Attend 10th month warranty meeting.
 - 3. Design Team (Provided for information only):
 - a. Attend 10th month warranty review meeting.
 - b. Coordinate resolution of design non-conformance and/or design deficiencies identified during this phase.
 - c. Review and comment on the Final Commissioning Report.
 - 4. Commissioning Authority (Provided for information only):
 - a. Assemble the final Cx documentation including the Final Commissioning Report. Submit this documentation to the Owner for review and acceptance.

- b. Finalize the Systems Manual inclusive of the systems to be commissioned. Insert system descriptions as provided by the Design Team in the Basis of Design.
 - c. Returns to the site at 10 months into the warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract.
 - d. Conduct building envelope warranty walk to visually inspect exterior enclosure (including roofing systems).
5. Construction Manager:
- a. Attend 10th month warranty review meeting.
 - b. Coordinate the correction of deficiencies identified as being either warranty items or items under the original construction contract.
6. Sub-Contractors:
- a. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal or deferred testing.
 - b. Attend 10th month warranty review meeting.
 - c. Address outstanding warranty issues and tasks identified as being under the original construction document.

3.2 PROJECT SCHEDULE

- A. Commissioning Authority will provide to the Construction Manager a Schedule identifying the Cx Activities for the Project. The Construction Manager shall incorporate these Cx activities into the Master Project Schedule. The Commissioning Authority will review and update Cx activities along with the Construction Manager's Master Schedule update.

3.3 REQUEST FOR INFORMATION

- A. The Design Team will include the Cx Authority in the distribution of answered and updates or additions to the construction documents including all RFIs, ASIs, Addendums, PCRs and Change Orders.

3.4 COMMISSIONING COORDINATION MEETINGS

- A. The Commissioning Authorities will conduct periodic Cx Coordination Meetings throughout the construction phase of the project. Commissioning Team Members are required to attend these meetings.
- B. The purpose of conducting Cx Coordination Meetings separate from the regular project progress meetings is to focus on the Commissioning Process activities status, schedule and issues.
- C. Commissioning Authority will lead meetings, record meeting minutes and distribute minutes to all attendees with copies to appropriate entities.

- D. Commissioning Coordination Meetings to be held at the Contractor's Field Office. These meetings will usually be held in conjunction with regularly-scheduled construction progress or OAC meetings.

3.5 QUALITY ASSURANCE TESTING

- A. Contractor Field Testing:
 - 1. The Commissioning Authority will receive one (1) copy of ALL systems cleaning, QA/QC testing and start-up reports from the Contractor and assemble for record into the Final Commissioning Report.
- B. Independent Testing:
 - 1. The Commissioning Authority will receive one (1) copy of ALL independent systems cleaning, QA/QC testing and start-up reports from the Contractor and assemble for record into the Final Commissioning Report.

3.6 SUBSTANTIATING SYSTEM READINESS

- A. The Commissioning Authority will prepare and issue to the Contractor a Pre-Functional Checklist form for each system or major piece of equipment to be commissioned. Pre-Functional Checklists are important to ensure that the equipment and systems are installed and operational. It ensures that functional performance and integrated systems testing may proceed without unnecessary delays. Each piece of equipment received full pre-functional checkout by the contractors. No sampling strategies are used for Pre-Functional Checklist. The pre-functional checklists for a given system must be successfully completed prior to formal functional performance and integrated systems testing of the system.
- B. The Commissioning Authority will monitor and track the completion of the Pre-Functional Checklist forms.
- C. The Contractor shall complete the Pre-Functional Checklists, provided by the Commissioning Authority, as follows:
 - 1. Pre-Functional Checklists should be maintained in a binder(s) or electronically at the Construction Manager's project site office and are subject to review for comparison between the completion level of the Checklists and the status of the work during site observation visits by the Commissioning Authority.
 - 2. Complete Section 1 "Equipment Delivery" of the Pre-Functional Checklist after equipment delivery to the site.
 - 3. Complete Section 2 "Equipment Installation" of the Pre-Functional Checklist after the equipment installation is complete.
 - 4. Complete Section 3 "Equipment Start-up" of the Pre-Functional Checklist after the equipment has been successfully started. The contractor is to forward copies of all manufacturer's start-up forms and reports to the Commissioning Authority.
 - 5. Complete Section 4 "BAS/Power Monitoring/Lighting Control Integration" of the Pre-Functional Checklist after the equipment and systems control configuration and integration process has been completed.
 - 6. Complete Section 5 "Notification for Testing" of the Pre-Functional Checklist after the equipment is fully operational and ready for functional performance and integrated systems testing

7. Completed and signed Pre-Functional Checklists are a pre-requisite for commencing functional performance and integrated systems testing.
 8. Only individuals that have direct knowledge and witnessed that a line item task on the Pre-Functional Checklist was actually performed shall initial or check off that item.
- D. The Contractor shall clearly list any outstanding items from the Pre-Functional Checklists and/or manufacturer start-up reports and checklists that were not completed successfully in the Comments section of the applicable Pre-Functional Checklist. The Commissioning Authority will review any items/issues listed and will address them through discussion with the design team and Construction Manager prior to proceeding with functional performance and integrated systems testing.
- E. The Contractor shall develop detailed start-up plans for all equipment. These plans shall be reviewed by the Design Team and the Commissioning Authority for completeness and verification that the manufacturer-recommended procedures have been completed.
1. The contractor responsible for the installation and start-up of the equipment is responsible for developing the start-up plan by combining the Pre-Functional Checklist with the manufacturer's detailed start-up and checkout procedures and any required quality assurance testing.
 2. The contractor shall maintain an updated and annotated copy of the start-up plan that shall be accessible for review by the Design Team and the Commissioning Authority at periodic intervals.
 3. The completed start-up procedures shall be provided along with the completed Pre-Functional Checklists to the Commissioning Authority prior to the Contractor's certification that the systems are ready for Functional Performance and Integrated Systems Testing.

3.7 OPERATION AND MAINTENANCE DATA

- A. The Commissioning Process has special requirements on compiling and submitting Operation and Maintenance Data. O&M Data is required to be submitted to the Commissioning Authority immediately after receipt of the approved submittal from the Design Team. Refer to Section 01 78 23 as well as specific sections within Division 22, 23 and 26 for specific requirements for O&M manual contents.

3.8 FUNCTIONAL PERFORMANCE AND INTEGRATED SYSTEMS TESTING

- A. The Commissioning Authority will develop, coordinate and witness the Functional Performance and Integrated Systems Test Procedures to be used on the systems being commissioned. The objective of functional performance and integrated systems testing is to demonstrate that each system is operating according to the documented basis of design and Contract Documents. Functional performance and integrated systems testing facilities bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functionality of the system.
- B. The Test Procedures will be developed by the Commissioning Authority to reflect operation through all modes (seasonal, occupied, unoccupied, part- and full-load, etc.)

where there is a specified systems response. Verifying each sequence within the sequence of operations is required. Each contractor associated with any particular system to be commissioned is responsible for providing requested information to the Commissioning Authority to assist in development of the Test Procedures. The Test Procedures will be submitted to the remainder of the Commissioning Team in advance of scheduled Functional Performance and Integrated Systems Testing to give all members of the Commissioning Team time to review the Procedures and make comments or suggest revisions. Each Contractor is responsible for reviewing the Test Procedures prior to conducting the testing. Refer to sample Functional Performance and Integrated Systems Test Procedure at the end of this Section.

- C. The Contractor is required to provide all testing instruments and all skilled labor required to conduct the Functional Performance and Integrated Systems Test Procedures. The Commissioning Authority will attend all Functional Performance and Integrated Systems Testing and record all results of the Testing on the Functional Performance and Integrated Systems Test Procedure.
 - D. Each function and test of the Functional Performance and Integrated Systems Testing shall be performed under conditions that simulate actual conditions as close as is practically possible. The contractor executing the test shall provide all necessary materials, systems modifications, etc. to produce the necessary flows, pressures, temperatures, etc. required to execute the test according to the specified conditions. At completion of the test, the contractor shall return all affected building equipment and systems from these temporary modifications to their pre-test condition.
 - E. Sampling:
 - 1. Multiple identical pieces of non-life safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference alone does not constitute a difference. The specific sampling rates associated with each system or type of equipment will be identified within the Commissioning Plan and will be in accordance with ASHRAE Guideline 1.1 – *2007 HVAC&R Technical Requirements for the Commissioning Process*.
 - 2. A sampling strategy will be used as “XX% Sampling – YY% Failure Rate” defined as:
 - XX = the percent of the group of identical equipment to be included in each sample.
 - YY = the percent of the sample that, if failing, will require another sample to be tested.
- As an example, a 20% Sampling – 10% Failure Rate will be represented as:
- a. Randomly test at least 20% of each group of identical equipment. This 20% constitutes the “first sample”.
 - b. If 10% of the units in the first sample fail the functional performance and integrated systems tests, test another 20% of the group (second sample).
 - c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
 - d. If at any point, frequent failures are occurring and testing is delayed by troubleshooting testing and verification cannot be successfully completed, the Commissioning Authority may stop the testing and require the

responsible contractor to perform and document a checkout of the remaining units prior to continuing with Functional Performance and Integrated Systems Testing.

- e. Costs associated with testing systems beyond the initial sample rate for all parties including the Commissioning Authority are the responsibility of the Construction Team.

- F. Pre-requisite documents to be submitted to the Commissioning Authority prior to Functional Performance and Integrated Systems Testing:
 - 1. Updated/Completed Pre-Functional Checklists.
 - 2. Test and Balance Report (preliminary).
 - 3. Contractors' QA/QC Testing Reports.
 - 4. Contractors' Start-Up Reports.
 - 5. O&M Manuals.
 - 6. Trend data from Building Automation Systems points (as identified).

- G. Should Functional Performance and Integrated Systems Testing be delayed due inadequate documentation, lack of proper test equipment, absent contractor personnel, or incomplete systems and controls (not ready for Functional Performance or Integrated Systems Testing); testing shall be stopped. Any associated delays or additional services costs associated with the halted testing will be ascribed to the responsible contractor.

3.9 CORRECTIVE ISSUE REPORT

- A. The Commissioning Authority will document deficiencies discovered during Functional Performance and Integrated Systems Testing of systems in a Corrective Issue Report. The Commissioning Authority will then forward this form to the Construction Manager for action in correcting the deficiency.

- B. When the deficiency has been corrected, the Construction Manager shall note action taken and return the Corrective Issue Report to the Commissioning Authority. Any issues with open resolutions that are not agreed upon between the Contractors and the Commissioning Authority shall be reviewed and commented on by the Design Team for resolution and ultimately accepted by the Owner's project manager.

- C. Items on the Corrective Issues Report must be completed as a pre-requisite for Substantial Completion. Refer to Section 01 77 00.

- D. The costs for any re-testing related to deficiencies discovered during Functional Performance and Integrated Systems Testing shall be the responsibility of the Construction Team.

3.10 DEFERRED AND/OR SEASONAL TESTING

- A. Unforeseen Deferred Testing – If any check or test cannot be completed due to the building structure, phasing, required occupancy condition, or other deficiency, execution of the checklists and functional performance and/or integrated systems testing may be delayed upon approval from the Owner's project manager. These tests

will be conducted in the same manner as test conducted during the Testing Phase as soon as possible.

END OF SECTION 01 91 13

SECTION 03 30 53

MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Action Submittal:
 - 1. Design Mixtures: For each concrete mixture.

1.3 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Comply with ACI 301.
- C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORMWORK

- A. Furnish formwork and formwork accessories according to ACI 301.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I, Type II, or Type III. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C or F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2-inch nominal maximum aggregate size.
- C. Water: ASTM C 94/C 94M.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 CONCRETE MIXTURES

- A. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Contraction Joints in Slabs-on-Grade: Form weakened-plane sawed contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness.

- C. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

3.5 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment.

3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/2 inch.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete
Insert locations.
- C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed finished as-cast concrete where indicated:
 - 1. Smooth-rubbed finish.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.7 FINISHING UNFORMED SURFACES

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

- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab 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.
- E. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

- Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.
 1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

3.10 REPAIRS

- A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION

SECTION 03 35 19

CHEMICALLY STAINED CONCRETE FLOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes chemically stained concrete floor finish and sealer.

1.2 PRE-INSTALLATION CONFERENCE

- A. One week prior to the placement of chemical stain, conduct a meeting to discuss the project and application of materials.
 - 1. Architect, Contractor, subcontractor and manufacturer's representative shall be present.

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's technical data sheets and installation instructions for each product specified.
- B. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.
- C. Qualification Data: For firms indicated in "Quality Assurance" Article, including lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, including lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For chemically stained concrete floors and sealers to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of stain and sealer products shall have minimum 5 years experience in the production of the specified products.
- B. Installer Qualifications: Minimum 3 years experience in staining applications and successfully completed not less than 6 projects comparable in scale and complexity.
- C. Source Limitations: Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.
- D. Mock-up:
 - 1. At Project location selected by Architect, prepare a mock-up, minimum 4 by 4 feet, for review and approval.
 - 2. Construct mock-up using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in mock-up panels.
 - 3. Retain approved mock-up through completion of the Work for use as a quality standard for finished work.
 - 4. Approved mock-up may become part of the completed Work if approved.

1.7 COORDINATION

- A. Coordinate Work of this section with trades performing concrete finishing work specified in Section 03 30 53 – “Miscellaneous Cast-in-Place Concrete”. Use only self-dissipating chemical curing compounds or moisture-curing methods to cure green concrete. Do NOT apply combination curing and hardening materials.
- B. Contractor shall be advised that the concrete slab is the finished floor. Do not allow marking of the floor in finished areas other than with chalk. Do not apply chemicals of any kind, other than those approved by staining system manufacturer. No chemical process or cleaning system is known that will remove petroleum stains, hydraulic fluid and certain other chemicals from concrete surfaces. **The prevention of spills is essential:**
 - 1. DO NOT allow trades to park vehicles on the slab without protection, such as plastic or non-absorbent drop clothes, under the vehicles.
 - 2. DIAPER any hydraulic equipment used on the floor during the construction process.
 - 3. NO PIPE FITTING/CUTTING will take place on the floor slab.
 - 4. DO NOT place steel on the slab without protection beneath.
 - 5. CHECK TIRES on equipment for screws and nails as these can cause chips in the floor.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.
- B. Store specified products in conditions recommended by the manufacturer.

1.9 PROJECT CONDITIONS

- A. Environmental Conditions: Maintain an ambient temperature of between 50 and 90° F during application and at least 48 hours after application.
- B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by the following:
 - 1. L. M. Scofield Company.
- B. Substitutions: Comply with Section 01 25 00.

2.2 MATERIALS

- A. Chemical Stain: Reactive water-based solution of metallic salts which react with the calcium hydroxide in the cured concrete substrate to produce permanent, variegated or translucent color effects.
 - 1. Acceptable Product: L. M. Scofield Company; Lithochrome Chemstain.
 - 2. Colors: Refer to Finish Schedule on Drawings.
- B. Sealer: Water-based, clear aliphatic polyurethane specifically formulated for protecting chemically stained concrete hardscapes and floors.
 - 1. Acceptable Product: L. M. Scofield Company; Scofield Selectseal-W.
- C. Sealant: L. M. Scofield Company; Lithoseal Trafficalk-3G.
 - 1. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

- B. Compliance with Manufacturer's Instructions: Obtain, understand and comply with the current versions of the manufacturer's technical data sheets and installation instructions.

3.2 PREPARATION

A. New Concrete:

1. Newly placed concrete shall be sufficiently cured to allow concrete to become reactive, minimum 14 days.
2. If any of the following colors are used, the minimum cure time of the concrete shall be 30 to 60 days to meet water vapor transmission requirements.
 - a. Copper Patina.
 - b. Fern Green.
 - c. Weathered Bronze.
3. Do NOT use liquid curing materials. Cure concrete with new, unwrinkled, non-staining, high quality curing paper. Do not overlap curing paper.
4. Section pours shall be cured using the same methods and chemically stained when the concrete is the same age.
5. Immediately prior to chemically staining, thoroughly clean the concrete. Sweep surfaces, then pressure wash or scrub using a rotary floor machine. Use suitable, high quality commercial detergents to facilitate cleaning. Rinse surfaces after cleaning until rinse water is completely clean. Allow floor to dry completely prior to application of floor stain.

B. Existing Concrete:

1. Clean concrete surfaces so that surfaces are completely penetrable before receiving the initial application of chemical stain. Test surfaces to receive stain by spotting with water. Water should immediately darken the substrate and be readily absorbed. If water beads and does not penetrate or only penetrates in some areas, additional surface preparation and testing shall be performed. On denser floors, acid wash with a solution of one part muriatic acid (31.4 percent pool acid) to 20 parts water, or sand lightly to open up surfaces. Retest and continue surface preparation until water spots immediately darken and uniformly penetrate concrete surfaces.
2. Cleaning method used depends on the condition of the concrete surface. To remove dirt and other contaminants, detergents and other commercial grade cleaners should be considered and tested.
3. Rinse concrete substrates until rinse water is completely clean.

- C. Scoring: Score decorative jointing in concrete surfaces 1/8-inch (3.2 mm) deep with diamond blades. Rinse until water is completely clean. Score before staining.

3.3 APPLICATION OF CHEMICAL STAIN

- A. Concrete surfaces shall be dry and properly prepared as described above. Protect surrounding areas from over-spray, run-off and tracking. Divide surfaces into small work sections using wall, joint lines, or other stationary breaks as natural stopping points.
- B. Apply chemical stains full strength (undiluted) at the coverage rate recommended by the manufacturer and use application equipment described in the manufacturer's printed technical literature. The color of the liquid chemical stain has no resemblance to the final color produced on the concrete substrate.
- C. Chemical stains normally fizz when reacting with the concrete. If fizzing does not occur, the substrate has not been adequately prepared or the concrete pH level is too low. If this should happen, contact the local representative for further recommendations.
- D. Transfer chemical stain to the substrate by brush or spray and immediately scrub into surface.
- E. Reaction time depends on temperature and humidity levels.
- F. When multiple coats of one or more colors are required, washing and drying between colors is desirable to evaluate the color prior to the next coat.
- G. After the final coat of chemical stain has remained on the surface for a minimum of four hours, remove all residue by wet scrubbing with commercial grade detergent. Rinse surfaces after scrubbing until rinse water is completely clean. Run off may stain the adjacent areas or harm plants. Collect rinse water by wet vacuuming or absorbing with an inert material.

3.4 APPLICATION OF SEALER

- A. Concrete substrate shall be completely dry.
- B. Sealer shall be produced by the chemical stain manufacturer.
- C. Test surface for proper PH level prior to applying sealer.
- D. Apply sealer according to manufacturer's written instructions at a rate of 300 to 500 square feet per gallon per coat.
- E. Maintain a wet edge at all times.
- F. Allow sealer to completely dry before applying additional coats.
- G. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.
- H. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.5 PROTECTION

- A. Protect floor from traffic for at least 72 hours after final application of sealer.

3.6 MAINTENANCE

- A. Maintain chemically stained and sealed floors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet-clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Maintain interior floors that require polishing by using a compatible, premium-grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.

END OF SECTION

SECTION 03 35 43
POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes polished concrete finishing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of product requiring color selection.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: From manufacturer, indicating contractor is a current certified applicator.

1.4 QUALITY ASSURANCE

- A. Application Qualifications: Company regularly engaged in satisfactory installation of similar materials and certified by the manufacturer. Provide a list of 5 projects of similar nature and complexity completed in the last 2 years.
- B. Field Sample Panels: After approval of samples, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.
 - 1. Locate panels as indicated or, if not indicated, as directed by Architect.
 - 2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

1.5 COORDINATION

- A. Coordinate Work of this section with trades performing concrete finishing work specified in Section 03 30 53 - "Miscellaneous Cast-in-Place Concrete". Use only self-dissipating chemical curing compounds or moisture-curing methods to cure green concrete. Do NOT apply combination curing and hardening materials.

- B. Contractor shall be advised that the concrete slab is the finished floor. Do not allow marking of the floor in finished areas other than with chalk. Do not apply chemicals of any kind, other than those approved by polishing system manufacturer. No chemical process or cleaning system is known that will remove petroleum stains, hydraulic fluid and certain other chemicals from concrete surfaces. The prevention of spills is essential:
1. DO NOT allow trades to park vehicles on the slab without protection, such as plastic or non-absorbent drop clothes, under the vehicles.
 2. DIAPER any hydraulic equipment used on the floor during the construction process.
 3. NO PIPE FITTING/CUTTING will take place on the floor slab.
 4. DO NOT place steel on the slab without protection beneath.
 5. CHECK TIRES on equipment for screws and nails as these can cause chips in the floor.

PART 2 - PRODUCTS

2.1 POLISHING EQUIPMENT

A. Polishing Machines:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. HTC Systems Unit 800.
 - b. SASE Diamatic System Unit 780.

B. Polishing Grits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. HTC Systems, Inc.
 - b. SASE Company, Inc.

2.2 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Decorative Concrete Supply.
 - b. ARDEX GmbH.
 - c. Euclid Chemical Company (The); an RPM company.
 - d. L&M Construction Chemicals, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Applicator present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify green concrete has cured a minimum of 14 days.
 - 2. Verify surfaces are clean, dry, physically sound, and free of contamination.
 - 3. Verify surfaces are free of holes, voids, or defects.
 - 4. Cracks and abrupt changes in surface profile must be corrected or accepted as is.
 - 5. Verify fins and projections have been removed.
 - 6. Verify all curing compounds and sealers have been removed.
- B. Contractor must report, in writing, surfaces left in improper condition by other trades. Application will constitute acceptance by the applicator.

3.2 PREPARATION

- A. Remove grease, dirt, form oil, and sealing/hardening compound residue.
- B. Patch holes in slabs with grout in accordance with manufacturer's instructions.
- C. Protect adjacent surfaces in accordance with manufacturer's instructions.

3.3 POLISHING

- A. Polish Level: As indicated on Drawings or approved mockups, in accordance with the following:
 - 1. Level 2: Low sheen, 400 grit
 - 2. Level 3: High sheen, 800 grit
 - 3. Level 4: Gloss shine, 3000 grit.
- B. Apply polished concrete finish system to cured and prepared slabs.
 - 1. Machine grind floor surfaces to receive polished finishes level and smooth.
 - 2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 - 3. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 - 4. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
 - 5. Control and dispose of waste products produced by grinding and polishing operations.
 - 6. Neutralize and clean polished floor surfaces.

3.4 PROTECTION

- A. Protect floor surfaces from soiling and damage until densifier has properly dried and cured.

END OF SECTION

SECTION 03 39 00
CONCRETE SEALING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes application of curing, sealing, and hardening compounds to concrete flooring.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY CONTROL

- A. Applicator Qualifications: Acceptable to manufacturer, with minimum three years documented experience applying specified products.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, unopened packages. Protect from freezing, direct sun exposure and exposure to moisture.

1.5 COORDINATION

- A. Coordinate work with concrete curing specified in Section 03 30 00 "Cast-in-Place Concrete".
- B. Combination curing and sealing" products are to be used only for finished flooring applications.
- C. Do not use combination curing and sealing products for concrete curing.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Curing Compound - Type 1 :
 - 1. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2. Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The), an RPM company; Kurez DR VOX.
 - b. L&M Construction Chemicals, Inc.; L&M Cure R.
 - c. Meadows, W. R., Inc.; 1100-CLEAR.
 - d. NoxCrete; Res-Cure.

- B. Curing and Sealing Compound - Type 2:
 1. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 2. Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The), an RPM company; Everclear VOX.
 - b. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
 - c. Meadows, W. R., Inc.; Vocomp-25.
 - d. NoxCrete; Eco-Seal XC.

- C. Hardener and Sealer - Type 3:
 1. Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
 2. Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The), an RPM company; Liqui-Hard.
 - b. L&M Construction Chemicals, Inc.; Fluohard.
 - c. NoxCrete; Duro-Nox LSC.

- D. Grout: Non-shrink, non-metallic grout as recommended by sealer manufacturer.

- E. Cleaners: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify concrete floors are clean and have obtained adequate strength.
- B. Verify any existing curing compounds have been removed before applying any curing and sealing compounds or densifiers.

3.2 PREPARATION

- A. Remove grease, dirt, form oil, and curing compound residue.
- B. Patch holes in slabs with grout in accordance with manufacturer's instructions.
- C. Protect adjacent surfaces in accordance with manufacturer's instructions.

3.3 APPLICATION

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

3.4 PROTECTION

- A. Protect floor surfaces from soiling and damage until sealing compound has properly dried and cured.

3.5 SCHEDULE

- A. Type 1: All new concrete floor slabs, unless moisture curing is required by other Division 03 Sections.
- B. Type 2: Provide at exposed floors slabs in rooms where no other finished flooring products are scheduled such as storage rooms, MEP closets, etc.
- C. Type 3: Provide under access floors at computer rooms, loading docks, and floors with forklift or pallet-jack traffic.

END OF SECTION

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Miscellaneous steel framing and supports.
 2. Miscellaneous steel trim.

1.2 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: 1-5/8 by 1-5/8 inches.
 2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

2.2 FASTENERS

- A. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
- B. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 91 23 "Interior Painting."
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. 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.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.6 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

2.7 STEEL AND IRON FINISHES

- A. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Section 09 91 23 "Interior Painting" unless indicated otherwise.
- B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

3.2 ADJUSTING AND CLEANING

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

END OF SECTION

SECTION 05 73 13

GLAZED DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-supported railings.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings to walls.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of railings assembled from standard components.

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

C. 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.
2. Each type of glass required.
3. Fittings and brackets.

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

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 5 years documented experience in work of this Section.
- B. Perform Work in accordance with ASTM E 985.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups as shown on Drawings.
 - 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide VIVA Railings, LLC; SHOE™ Railing System or a comparable product by one of the following:
 - 1. Architectural Metal Works.
 - 2. Architectural Railings & Grilles, Inc.
 - 3. Blum, Julius & Co., Inc.
 - 4. CraneVeyor Corp.
 - 5. Laurence, C. R. Co., Inc.
 - 6. Livers Bronze Co.
 - 7. Newman Brothers, Inc.
 - 8. P & P Artec.
 - 9. Wylie Systems.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. 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. Performance characteristics are indicated by criteria subject to

verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 45 16 "Contractor's Quality Control," to design railings, including attachment to building construction.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 1. Stainless Steel: 60 percent of minimum yield strength.
 2. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."
- C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
 3. Glass-Supported Railings: Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.4 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Extruded Bars and Shapes: ASTM B 221, Alloy 6063-T5/T52.

2.5 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312/A 312M, Grade TP 304.
- C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666 or ASTM A 240/A 240M, Type 304.
- E. Bars and Shapes: ASTM A 276, Type 304.

2.6 GLASS AND GLAZING MATERIALS

- A. Safety Glazing: Glazing shall comply with 16 CFR 1201, Category II.
- B. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials.
 - 1. Glass Color: Clear.
 - 2. Thickness for Structural Glass Balusters: As required by structural loads, but not less than 12.0 mm.
- C. Safety Glazing Labeling: Permanently mark glass with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

- D. Glazing Gaskets for Glass Infill Panels: Glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.

2.7 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Aluminum Components: Type 316 stainless-steel fasteners.
 - 2. Stainless-Steel Components: Type 316 stainless-steel fasteners.
 - 3. Dissimilar Metals: Type 316 stainless-steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are the standard fastening method for railings indicated.
 - 1. 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.
 - 1. Material Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.8 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- H. Form changes in direction as follows:
 - 1. By flush bends or by inserting prefabricated flush-elbow fittings.
- 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 end fittings.
- K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work where indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

2.9 GLAZING PANEL FABRICATION

- A. General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.
 - 1. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces.
 - 2. Grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.
- B. Structural Balusters: Provide tempered glass panels.

2.10 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
- C. Dull Satin Finish: No. 6.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- E. Sputter-Coated Finish: Titanium nitride coating deposited by magnetic sputter-coating process over indicated mechanical finish.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 RAILING CONNECTIONS

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

3.3 INSTALLING GLASS PANELS

- A. Glass-Supported Railings: Install assembly to comply with railing manufacturer's written instructions.
 - 1. Attach base channel to building structure, then insert glass into base channel and secure glass using manufacturer's standard method.
 - a. Support glass panels in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing.
 - 2. Adjust spacing of glass panels so gaps between panels are equal before securing in position.
 - 3. Erect glass railings under direct supervision of manufacturer's authorized technical personnel.

3.4 CLEANING

- A. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

3.5 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

SECTION 05 73 13

GLAZED DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-supported railings.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings to walls.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of railings assembled from standard components.

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

C. 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.
2. Each type of glass required.
3. Fittings and brackets.

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

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 5 years documented experience in work of this Section.
- B. Perform Work in accordance with ASTM E 985.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups as shown on Drawings.
 - 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide VIVA Railings, LLC; SHOE™ Railing System or a comparable product by one of the following:
 - 1. Architectural Metal Works.
 - 2. Architectural Railings & Grilles, Inc.
 - 3. Blum, Julius & Co., Inc.
 - 4. CraneVeyor Corp.
 - 5. Laurence, C. R. Co., Inc.
 - 6. Livers Bronze Co.
 - 7. Newman Brothers, Inc.
 - 8. P & P Artec.
 - 9. Wylie Systems.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. 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. Performance characteristics are indicated by criteria subject to

verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 45 16 "Contractor's Quality Control," to design railings, including attachment to building construction.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 1. Stainless Steel: 60 percent of minimum yield strength.
 2. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."
- C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
 3. Glass-Supported Railings: Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.4 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Extruded Bars and Shapes: ASTM B 221, Alloy 6063-T5/T52.

2.5 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312/A 312M, Grade TP 304.
- C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666 or ASTM A 240/A 240M, Type 304.
- E. Bars and Shapes: ASTM A 276, Type 304.

2.6 GLASS AND GLAZING MATERIALS

- A. Safety Glazing: Glazing shall comply with 16 CFR 1201, Category II.
- B. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials.
 - 1. Glass Color: Clear.
 - 2. Thickness for Structural Glass Balusters: As required by structural loads, but not less than 12.0 mm.
- C. Safety Glazing Labeling: Permanently mark glass with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

- D. Glazing Gaskets for Glass Infill Panels: Glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.

2.7 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Aluminum Components: Type 316 stainless-steel fasteners.
 - 2. Stainless-Steel Components: Type 316 stainless-steel fasteners.
 - 3. Dissimilar Metals: Type 316 stainless-steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are the standard fastening method for railings indicated.
 - 1. 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.
 - 1. Material Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.8 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- H. Form changes in direction as follows:
 - 1. By flush bends or by inserting prefabricated flush-elbow fittings.
- 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 end fittings.
- K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work where indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

2.9 GLAZING PANEL FABRICATION

- A. General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.
 - 1. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces.
 - 2. Grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.
- B. Structural Balusters: Provide tempered glass panels.

2.10 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
- C. Dull Satin Finish: No. 6.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- E. Sputter-Coated Finish: Titanium nitride coating deposited by magnetic sputter-coating process over indicated mechanical finish.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 RAILING CONNECTIONS

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

3.3 INSTALLING GLASS PANELS

- A. Glass-Supported Railings: Install assembly to comply with railing manufacturer's written instructions.
 - 1. Attach base channel to building structure, then insert glass into base channel and secure glass using manufacturer's standard method.
 - a. Support glass panels in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing.
 - 2. Adjust spacing of glass panels so gaps between panels are equal before securing in position.
 - 3. Erect glass railings under direct supervision of manufacturer's authorized technical personnel.

3.4 CLEANING

- A. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

3.5 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

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Wood furring and grounds.
3. Wood sleepers.
4. Utility shelving.
5. Plywood backing panels.

1.2 INFORMATIONAL SUBMITTALS

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

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

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

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

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

construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- 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 sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
 2. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 3. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
 4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, 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. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 2. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.
- B. 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.
- C. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Application: Treat items indicated on Drawings, and the following:
 1. Framing for raised platforms.
 2. Concealed blocking.
 3. Plywood backing panels.

2.4 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. Furring.
 - 4. Grounds.
 - 5. Utility shelving.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.
- C. For utility shelving, provide lumber with 15 percent maximum moisture content of eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine, No. 2 grade; SPIB.
 - 2. Eastern softwoods, No. 2 Common grade; NELMA.
 - 3. Northern species, No. 2 Common grade; NLGA.
 - 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

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 in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Power-Driven Fasteners: NES NER-272.
- C. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, as appropriate to framing members, and length as recommended by screw manufacturer for material being fastened.

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 to other construction; scribe and cope as needed for accurate fit.
- B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

3.2 PROTECTION

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

END OF SECTION

SECTION 06 41 13

WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Architectural wood cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
3. Shop finishing of architectural wood cabinets.

B. Related Requirements:

1. Division 12 sections for countertops as indicated on the Drawings.

1.2 DEFINITIONS

A. Exposed Surfaces:

1. Surfaces visible when doors and drawers are closed.
2. Bottoms of cases more than 4'-0" above finish floor.
3. Back and edges of hinged doors exposed when opened.

B. Semi-Exposed Surfaces:

1. Surfaces that become visible when drawers and doors are open.
2. Tops of cases 6'-0" or more above finish floor.

C. Concealed Surfaces: Surfaces not visible after installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, cabinet hardware and accessories, and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Lumber for transparent finish, not less than 5 inches (125 mm) wide by 12 inches (300 mm) long, for each species and cut, finished on one side and one edge.

2. Veneer leaves representative of and selected from flitches to be used for transparent-finished cabinets.
3. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products.
- C. AWS Catalog: Catalog numbers indicated on the drawings and in the specifications are for the convenience of identifying specific cabinet types. Unless modified by notation on the drawings or otherwise specified, current description for indicated number, together with indicated or specified options or accessories, constitutes requirements for each cabinet.
 1. Catalog numbers and specific requirements indicated on the drawings and in the specification are given for the purpose of establishing standard design and quality of materials, construction, and workmanship.
 2. Catalog numbers noted on the drawings are based upon AWS, Appendix A.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect architectural woodwork with appropriate heavy duty wrapping materials at factory prior to shipment. Mark each unit with appropriate identification required for installation.
- B. Protect architectural woodwork during handling, transit and storage to prevent damage and deterioration. Store in conditioned space complying with environmental limitations described above.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOOD CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents may contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.2 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Grade: Custom.
- B. Type of Construction: Frameless.
- C. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
- D. Wood for Exposed Surfaces – Species, Cut, and Grain Direction: As indicated on Drawings.
 1. Matching of Veneer Leaves: Book match, unless indicated otherwise.
- E. Semiexposed Surfaces: Provide surface materials indicated below:
 1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
 2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, same species indicated for exposed surfaces.
 3. Drawer Bottoms: Hardwood plywood.
- F. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Wood Moisture Content:
 - a. 5 to 10 percent: Typical, except:
 - 1) 8 to 13 percent: For projects in damp, coastal areas.
 - 2) 4 to 9 percent: For projects in dry, arid areas.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.

3. Softwood Plywood: DOC PS 1.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

2.4 METAL TRIM

- A. Metal Surfaces: For fabrication of metal trim which will be exposed to view, use only materials which are smooth and free of surface blemishes.
- B.
- C. Surface Flatness and Edges: For exposed work, provide materials which have been cold-rolled, cold-finished, cold drawn, stretcher leveled, machine cut and otherwise produced to highest commercial standard for flatness with edges and corners sharp and true to angle or curvature as required.
- D. Stainless Steel: Provide in standard commercial tempers and hardness, as required for fabrication strength and durability.
- E. Fasteners: Same basic metal or alloy as metal fastened or stainless steel.
- F. Rods, Threaded Sockets and Brackets: Provide forms and type shown; standard commercial tempers, hardness and threads.

2.5 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware."
- B. Pulls: As indicated on the Drawings.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100, 135, or 170 degrees of opening (provide maximum opening as permitted by adjacent wall condition), self-closing.
- D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 (typical, unless indicated otherwise); BHMA A156.9, B04102; with shelf brackets, B04112 (knife-type brackets for mounting at rear of shelves, where indicated).
- F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- G. Drawer Slides: BHMA A156.9.
 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.

3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.
 4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
 6. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-100.
- H. Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.
1. Acceptable Product for Slides Only, 16 inches (400 mm) Wide and Less: Adjustable height, 75 pound load rating; Accuride "2109".
 2. Acceptable Product for Slides and Tray: Fixed tilt, adjustable height; Accuride "Cbergo-Tray 200".
 3. Acceptable Product for Slides, Tray and Accessories: Adjustable tilt, adjustable height, cable management, palm rest, and mouse pad; Accuride "Cbergo-Tray 300".
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Door and Drawer Silencers: BHMA A156.16, L03011.
- L. Work Surface Support Bracket:
1. Stamped metal.
 2. 24-1/4" x 18-1/4"; 400 lb. capacity per pair; maximum depth 26".
 3. Finish: Crinkle Powder Coat; color as selected by Architect.
 4. Acceptable Product: SWS4 by Doug Mockett & Company, Inc.
- M. Coat Hooks:
1. Finish: Burnish cast aluminum double hook.
 2. Acceptable Product: No. 580 by Ives (if double hook).
- N. Hanging Rods:
1. Closet Shelf and Rod Supports:
 - a. Steel; painted white.
 - b. 11"L x 10" H
 - c. 1195 by Knappe & Vogt.
 2. Center Support:
 - a. 24" Length; 1-1/16" od tubing; anochrome finish.
 - b. 760 by Knappe and Vogt.

3. Tubing: Stainless Steel; 1-1/16" diameter; 660 by Knape & Vogt.
 4. Tubing Flange: 1-1/16" o.d. mounted with two 5mm pins.
 5. End Cap: 730 by Knape and Vogt.
- O. Exposed Hardware Finishes: Satin Stainless Steel: BHMA 630, typical unless indicated otherwise on the Drawings.
1. For other exposed hardware finishes indicated, provide finish that complies with BHMA A156.18 for BHMA finish numbers as follows:
 - a. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
 - b. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.
 - c. Satin Brass, Blackened, Bright Relieved, Clear Coated: BHMA 610 for brass base; BHMA 636 for steel base.
 - d. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - e. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.

2.6 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.7 FABRICATION

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

2.8 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- C. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: System - 5, conversion varnish.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 - 4. Staining: None required, unless noted otherwise on Drawings.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523, unless noted otherwise on Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips, or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- F. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

END OF SECTION

SECTION 06 41 16

PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets and countertops.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Division 12 sections for countertops as indicated on the Drawings.

1.2 DEFINITIONS

A. Exposed Surfaces:

1. Surfaces visible when doors and drawers are closed.
2. Bottoms of cases more than 4'-0" above finish floor.
3. Back and edges of hinged doors exposed when opened.

B. Semi-Exposed Surfaces:

1. Surfaces that become visible when drawers and doors are open.
2. Tops of cases 6'-0" or more above finish floor.

C. Concealed Surfaces: Surfaces not visible after installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, high-pressure decorative laminates, adhesive for bonding plastic laminate and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of cutouts and holes for plumbing fixtures faucets, soap dispensers, electrical switches and outlets and other items installed in plastic-laminate countertops.

C. Samples:

1. Plastic laminates, 12 by 12 inches (300 by 300 mm), for each color, pattern, and surface finish, with one sample applied to core material and edge material applied to one edge.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products.
- C. AWS Catalog: Catalog numbers indicated on the drawings and in the specifications are for the convenience of identifying specific cabinet types. Unless modified by notation on the drawings or otherwise specified, current description for indicated number, together with indicated or specified options or accessories, constitutes requirements for each cabinet.
 1. Catalog numbers and specific requirements indicated on the drawings and in the specification are given for the purpose of establishing standard design and quality of materials, construction, and workmanship.
 2. Catalog numbers noted on the drawings are based upon AWS, Appendix A.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect plastic-laminate-faced architectural cabinets with appropriate heavy duty wrapping materials at factory prior to shipment. Mark each unit with appropriate identification required for installation.
- B. Protect architectural woodwork during handling, transit and storage to prevent damage and deterioration. Store in conditioned space complying with environmental limitations described above.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents may contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: As indicated on Drawings.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels, unless indicated otherwise on the Drawings.
- G. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- I. Colors, Patterns, and Finishes: As indicated on the Drawings.

2.2 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
- B. Grade: Custom.

- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
 - 1. Manufacturers: As indicated on the Drawings.
- D. Colors, Patterns, and Finishes: As indicated on the Drawings.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces, unless indicated otherwise.
- F. Core Material at Sinks: Particleboard made with exterior glue.
- G. Core Thickness: 3/4 inch (19 mm).
 - 1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.
- H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content:
 - a. 5 to 10 percent: Typical, except:
 - 1) 8 to 13 percent: For projects in damp, coastal areas.
 - 2) 4 to 9 percent: For projects dry, arid areas.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - 3. Softwood Plywood: DOC PS 1.
 - 4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware."
- B. Pulls: As indicated on the Drawings.

- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100, 135, or 170 degrees of opening (provide maximum opening as permitted by adjacent wall condition), self-closing.
- D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 (typical, unless indicated otherwise); BHMA A156.9, B04102; with shelf brackets, B04112 (knife-type brackets for mounting at rear of shelves, where indicated).
- F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- G. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.
 - 4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 - 5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
 - 6. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-100.
- H. Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.
 - 1. Acceptable Product for Slides Only, 16 inches (400 mm) Wide and Less: Adjustable height, 75 pound load rating; Accuride "2109".
 - 2. Acceptable Product for Slides and Tray: Fixed tilt, adjustable height; Accuride "Cbergo-Tray 200".
 - 3. Acceptable Product for Slides, Tray and Accessories: Adjustable tilt, adjustable height, cable management, palm rest, and mouse pad; Accuride "Cbergo-Tray 300".
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Door and Drawer Silencers: BHMA A156.16, L03011.
- L. Work Surface Support Bracket:
 - 1. Stamped metal.
 - 2. 24-1/4" x 18-1/4"; 400 lb. capacity per pair; maximum depth 26".
 - 3. Finish: Crinkle Powder Coat; color as selected by Architect.
 - 4. Acceptable Product: SWS4 by Doug Mockett & Company, Inc.

M. Coat Hooks:

1. Finish: Burnish cast aluminum double hook.
2. Acceptable Product: No. 580 by Ives (if double hook).

N. Hanging Rods:

1. Closet Shelf and Rod Supports:

- a. Steel; painted white.
- b. 11”L x 10” H
- c. 1195 by Knappe & Vogt.

2. Center Support:

- a. 24” Length; 1-1/16” od tubing; anochrome finish.
- b. 760 by Knappe and Vogt.

3. Tubing: Stainless Steel; 1-1/16” diameter; 660 by Knappe & Vogt.
4. Tubing Flange: 1-1/16” o.d. mounted with two 5mm pins.
5. End Cap: 730 by Knappe and Vogt.

O. Exposed Hardware Finishes: Satin Stainless Steel: BHMA 630, typical unless indicated otherwise on the Drawings.

1. For other exposed hardware finishes indicated, provide finish that complies with BHMA A156.18 for BHMA finish numbers as follows:
 - a. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
 - b. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.
 - c. Satin Brass, Blackened, Bright Relieved, Clear Coated: BHMA 610 for brass base; BHMA 636 for steel base.
 - d. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - e. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.

2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.6 FABRICATION

- A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install cabinets and countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing of countertops: Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required.
 - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Install cabinets and countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- E. Scribe and cut cabinets and countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- F. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips, or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
 - 3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

END OF SECTION

SECTION 06 42 16
FLUSH WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flush wood paneling (wood-veneer wall surfacing).
2. Wood furring, blocking, shims, and hanging strips for installing flush wood paneling unless concealed within other construction before paneling installation.
3. Shop finishing of flush wood paneling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, adhesives, fire-retardant-treated materials, and finishing materials and processes.

B. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.

1. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
2. For paneling veneered in fabrication shop, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples:

1. Lumber for transparent finish, for each species and cut, finished on one side and one edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished paneling.
3. Veneer-faced panel products for transparent finish, 12 by 12 inches (300 by 300 mm), for each species and cut. Include at least one face-veneer seam and finish as specified.

1.3 QUALITY ASSURANCE

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

B. Installer Qualifications: Fabricator of products.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver wood paneling items until site conditions are adequate to receive work. Protect materials from weather while in transit.
- B. Store indoors in ventilated areas with constant but minimum temperature of 60 degrees F and maximum relative humidity of 25 percent to 55 percent.
- C. Keep materials dry during delivery and storage.
- D. Protect against exposure to weather and contact with damp or wet surfaces.
- E. Protect wood paneling as to prevent damage, soiling and deterioration.
- F. Spaces to receive wood paneling for installation shall have been conditioned for minimum of 48 hours to design temperature and humidity ranges, prior to commencing wood paneling installation.

PART 2 - PRODUCTS

2.1 WOOD PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of flush wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents may contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.2 FLUSH WOOD PANELING (WOOD-VENEER WALL SURFACING)

- A. Grade: Custom.
- B. Wood Species and Cut: As indicated on Drawings.
- C. Matching of Adjacent Veneer Leaves: Book match, unless indicated otherwise.
- D. Matching within Panel Face: Running match, unless indicated otherwise.

- E. Matching of Adjacent Veneer Leaves and within Panel Face: Slip, center, book match.
- F. Panel-Matching Method: Premanufactured panel sets selectively reduced in width within each separate area.
- G. Panel Core Construction: Fire-retardant particleboard.
 - 1. Thickness: 3/4 inch, unless indicated otherwise.
- H. Exposed Panel Edges: Inset solid-wood or wood-veneer matching faces.
- I. Panel Reveals: Matte black plastic laminate unless indicated otherwise.
- J. Fire-Retardant-Treated Paneling: Panels shall consist of wood-veneer and fire-retardant particleboard. Panels shall have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E 84 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
- K. Assemble panels by gluing and concealed fastening.

2.3 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content:
 - a. 5 to 10 percent: Typical, except:
 - 1) 8 to 13 percent: For projects in damp, coastal areas.
 - 2) 4 to 9 percent: For projects in dry, arid areas.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying 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.
 - 1. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, 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. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
 2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Flakeboard Company Limited; Duraflake FR.
 - b. SierraPine; Encore FR.

2.5 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.

2.6 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Complete fabrication, including assembly and finishing, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.7 SHOP FINISHING

- A. General: Finish paneling at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
 - 1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling. Concealed surfaces of plastic-laminate-clad paneling do not require backpriming when surfaced with plastic laminate.
- C. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: System - 5, conversion varnish.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 4. Staining: None required, unless noted otherwise on Drawings.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523, unless noted otherwise on Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with same grade as paneling to be installed.
- B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.
- C. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless covered by trim.

END OF SECTION

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SECTION 06 42 19

PLASTIC-LAMINATE-FACED WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced wood paneling (decorative laminate surfacing).
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced wood paneling unless concealed within other construction before paneling installation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesives, and fire-retardant-treated materials.
- B. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
- C. Samples for plastic laminates, for each type, color, pattern, and surface finish.

1.3 QUALITY ASSURANCE

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

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver wood paneling items until site conditions are adequate to receive work. Protect materials from weather while in transit.

- B. Store indoors in ventilated areas with constant but minimum temperature of 60 degrees F and maximum relative humidity of 25 percent to 55 percent.
- C. Keep materials dry during delivery and storage.
- D. Protect against exposure to weather and contact with damp or wet surfaces.
- E. Protect wood paneling as to prevent damage, soiling and deterioration.
- F. Spaces to receive wood paneling for installation shall have been conditioned for minimum of 48 hours to design temperature and humidity ranges, prior to commencing wood paneling installation.

PART 2 - PRODUCTS

2.1 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-faced wood paneling (decorative laminate surfacing) indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents may contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.2 PLASTIC-LAMINATE-FACED WOOD PANELING

- A. Grade: Custom.
- B. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3 and the following requirements:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Abet Laminati, Inc.
 - b. Arborite.
 - c. Formica Corporation.
 - d. Lamin-Art, Inc.
 - e. Panolam Industries International, Inc.
 - f. Wilsonart LLC.
 - 2. Faces: Grade VGF.
 - 3. Backs: Grade BKV.
 - 4. Exposed Edges: Same as faces.
- C. Colors, Patterns, and Finishes: As indicated on Drawings.

- D. Panel Core: Fire-retardant particleboard.
 - 1. Thickness: 3/4 inch, unless indicated otherwise.
- E. Exposed Panel Edges: Plastic-laminate matching faces.
- F. Panel Reveals: Stainless steel channels, 1 by 1 by 1/16 inch (25.4 by 25.4 by 1.6 mm) unless indicated otherwise.
- G. Fire-Retardant-Treated Paneling: Panels shall consist of fire-retardant plastic laminate and fire-retardant particleboard or fire-retardant, medium-density fiberboard. Panels shall have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E 84 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
- H. Assemble panels by gluing and concealed fastening.

2.3 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content:
 - a. 5 to 10 percent: Typical, except:
 - 1) 8 to 13 percent: For projects in damp, coastal areas.
 - 2) 4 to 9 percent: For projects dry, arid areas.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying 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.
 - 1. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, 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. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
 - 1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
 - 2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Flakeboard Company Limited; Duraflake FR.
 - b. SierraPine; Encore FR.

2.5 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.

2.6 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with same grade as paneling to be installed.
- B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.
- C. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless covered by trim.

END OF SECTION

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SECTION 06 42 23
PROFILED WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Decorative architectural carved wall panels.
- B. Related Sections include the following:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling and that are concealed within other construction before paneling installation.

1.2 DEFINITIONS

- A. Paneling includes wood furring, blocking, and shims for installing paneling, unless concealed within other construction before paneling installation.

1.3 SUBMITTALS

- A. Product Data: For panel products.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
 - 3. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
 - 4. For paneling veneered in fabrication shop, show veneer leaves with dimensions, pattern direction, and identification numbers indicating the sequence within the pattern for each leaf.
- C. Samples for Verification:
 - 1. Carved wood wall paneling, 24 by 24 inches, for each type, color, pattern, and surface finish.

- D. Qualification Data: For Installer.
- E. Product Certificates: For each type of product, signed by product manufacturer.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling.
- C. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" (AWS) for grades of architectural woodwork indicated for construction, finishes, installation, and other requirements.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. If paneling must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating paneling without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWS for quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
- C. Adhesives, General: Adhesives shall not contain urea formaldehyde.
- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Panel Adhesives: 50 g/L.
 - 3. Contact Adhesive: 80 g/L.
 - 4. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and that comply with requirements in this Article and with fire-test-response characteristics specified.
 - 1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
 - 1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div.

2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

- A. Paneling Grade: Provide Custom grade paneling complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
 - 1. Lay out one elevation at a time if approved by Architect.
 - 2. Notify Architect seven days in advance of the date and time when layout will be available for viewing.

3. Provide lighting of similar type and level as that of final installation for viewing layout, unless otherwise approved by Architect.
 4. Rearrange paneling as directed by Architect until layout is approved.
 5. Do not trim end units and other nonmodular size units to less than modular size until after Architect's approval of layout.
 6. Obtain Architect's approval of layout before start of assembly. Mark units and Shop Drawings with assembly sequence numbers based on approved layout.
- D. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.
- E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.5 PROFILED WOOD PANELING

- A. Decorative Architectural Carved Wall Panels:
1. Products: Subject to compliance with requirements, provide products indicated on Drawings.
- B. Panel Core Construction: Fire-retardant, medium-density fiberboard.
- C. Fire-Retardant-Treated Paneling: Provide panels consisting of fire-retardant plastic laminate and fire-retardant particleboard or fire-retardant, medium-density fiberboard. Panels shall have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E 84.
- D. Provide paneling of 3/4-inch minimum thickness. Assemble by gluing and concealed fastening.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with requirements for same grade specified in Part 2 for fabrication of type of paneling involved.
- B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
- C. Scribe and cut paneling to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening.
- E. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate functional and visual defects; where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 42 23
PROFILED WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Decorative architectural carved wall panels.
- B. Related Sections include the following:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling and that are concealed within other construction before paneling installation.

1.2 DEFINITIONS

- A. Paneling includes wood furring, blocking, and shims for installing paneling, unless concealed within other construction before paneling installation.

1.3 SUBMITTALS

- A. Product Data: For panel products.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
 - 3. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
 - 4. For paneling veneered in fabrication shop, show veneer leaves with dimensions, pattern direction, and identification numbers indicating the sequence within the pattern for each leaf.
- C. Samples for Verification:
 - 1. Carved wood wall paneling, 24 by 24 inches, for each type, color, pattern, and surface finish.

- D. Qualification Data: For Installer.
- E. Product Certificates: For each type of product, signed by product manufacturer.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling.
- C. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" (AWS) for grades of architectural woodwork indicated for construction, finishes, installation, and other requirements.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. If paneling must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating paneling without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWS for quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
- C. Adhesives, General: Adhesives shall not contain urea formaldehyde.
- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Panel Adhesives: 50 g/L.
 - 3. Contact Adhesive: 80 g/L.
 - 4. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and that comply with requirements in this Article and with fire-test-response characteristics specified.
 - 1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
 - 1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div.

2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

- A. Paneling Grade: Provide Custom grade paneling complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
 - 1. Lay out one elevation at a time if approved by Architect.
 - 2. Notify Architect seven days in advance of the date and time when layout will be available for viewing.

3. Provide lighting of similar type and level as that of final installation for viewing layout, unless otherwise approved by Architect.
 4. Rearrange paneling as directed by Architect until layout is approved.
 5. Do not trim end units and other nonmodular size units to less than modular size until after Architect's approval of layout.
 6. Obtain Architect's approval of layout before start of assembly. Mark units and Shop Drawings with assembly sequence numbers based on approved layout.
- D. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.
- E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.5 PROFILED WOOD PANELING

- A. Decorative Architectural Carved Wall Panels:
1. Products: Subject to compliance with requirements, provide products indicated on Drawings.
- B. Panel Core Construction: Fire-retardant, medium-density fiberboard.
- C. Fire-Retardant-Treated Paneling: Provide panels consisting of fire-retardant plastic laminate and fire-retardant particleboard or fire-retardant, medium-density fiberboard. Panels shall have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E 84.
- D. Provide paneling of 3/4-inch minimum thickness. Assemble by gluing and concealed fastening.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with requirements for same grade specified in Part 2 for fabrication of type of paneling involved.
- B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
- C. Scribe and cut paneling to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening.
- E. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate functional and visual defects; where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 42 26

SOLID MINERAL PROFILE PANELING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Solid mineral profile paneling and seam finishing materials to create a monolithic sculptured wall surface.
- B. Related Requirements:
 - 1. Section 09 21 16 "Gypsum Board Assemblies" for substrates and seam finishing
 - 2. Section 09 91 23 "Interior Painting" for sealing and painting of wall surfaces.
- C. Products Supplied But Not Installed Under This Section: Installation kit.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D: 256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
 - 2. ASTM D 638: Standard Test Method for Tensile Properties of Plastics.
 - 3. ASTM D 696: Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer.
 - 4. ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 5. ASTM D 2583: Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - 6. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. Gypsum Association:
 - 1. GA-214: Recommended Levels of Gypsum Board Finish.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Convene meeting at project site within one week of scheduled start of installation with representatives of the following in attendance: Owner, Architect, General Contractor, Installer, Finisher, and Painter.

2. Review substrate conditions, requirements of related work, installation instructions, seam finishing, and painting instructions, storage and handling procedures, and protection measures.
3. Keep minutes of meeting including responsibilities of various parties and deviations from specifications and installation instructions.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings:
 1. Include standard plans, elevations, sections, and mounting details.
 2. Include project specific details of terminations at adjacent surfaces.
- C. Samples: For each exposed product and profile, minimum 15 inches square in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer:
 1. Reference list containing minimum five previous completed installations of similar materials and complexity. Include contact name and e-mail address or telephone number for each project.
- B. Manufacturer's Installation Instructions.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum five years experience in producing mineral profile paneling.
- B. Installer Qualifications: Minimum three years experience in finish carpentry/architectural woodwork installation.
- C. Mockups: Build mockups to set quality standards for fabrication and installation.
 1. Build mockup in a location selected by Architect showing representative sample of installed products, including finished seam.
 2. Minimum Size: 8 feet by 8 feet.
 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:

1. Store panels in fully enclosed space, protected against damage from moisture, direct sunlight, and surface contamination.
2. Store panels vertically, in shipping crates, until ready to be installed. Loosen crate lids to allow for venting. Do not stack or lean against walls.
3. Store panels in area of installation minimum 24 hours prior to installation.

1.8 FIELD CONDITIONS

A. Ambient Conditions:

1. HVAC: Operate HVAC system to maintain occupancy level temperature and relative humidity conditions (35 to 67 percent) in the area of installation from 24 hours prior to delivery of panels to the installation area through remainder of construction period.
2. Lighting: Permanent project lighting, including any special lighting used to highlight the profiled panels, must be operational prior to seam finishing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Modular Arts, Inc.

2.2 COMPONENTS

A. Profile Panel: Smooth surface solid mineral composite panel containing no retardants, accelerators, release agents, or plastics.

1. Size: 32 by 32 by 1 inch maximum profile relief.
2. Physical Properties:
 - a. Tensile Strength: ASTM D 638: 960 psi.
 - b. Modulus of Elasticity: ASTM D 638: 1970 ksi.
 - c. Flexural Strength: ASTM D 790: 550 psi.
 - d. Flexural Modulus: ASTM D 790: 360 ksi.
 - e. Izod Impact Strength: ASTM D 256: 9.4 ft-lb/in².
 - f. Hardness: ASTM D 2583: 60 Barcol.
 - g. Thermal Expansion: ASTM D 696: 3.8×10^{-7} in/in °F.
 - h. Compressive Strength: ASTM D 696: 2.3 ksi.
 - i. Flame Spread Index: ASTM E 84: 0
 - j. Smoke Development Index: ASTM E 84: 0

3. Design(s): As indicated on Drawings.
 4. Orientation: As indicated on Drawings.
- B. Installation Kit: Item quantities in parenthesis denote quantities for (Small Kit-up to 50 panels/Large Kit-up to 100 panels).
1. Dry Mix Joint Compound: One 18 lb bag SHEETROCK® brand EASY SAND™ 45, or BEADDEX® brand SILVER SET™ 40.
 2. Acrylic Fortifier: (One/Two) quart THORO® ACRYL 60®.
 3. Construction Adhesive: (12/24) 10.2 oz tubes PL® Polyurethane Premium Construction Adhesive.
 4. Primer Sealer: (3/6) gal GLIDDEN® GRIPPER® WHITE PRIMER/SEALER GL-3210-1200.
 5. Countersink Drill Bit with Depth Stop-Collar: (One/Two) No. 7.
 6. Flexible Spreader: (One/Two) MUDTOOLS SMT-Y2
 7. Sandpaper: (15/30) sheets No-Load 220G, (10/20) sheets No-Load 150G.
 8. Plastic Container: (One/Two) 100 oz.
 9. Measuring Cup: One 8 oz.

2.3 ACCESSORIES

- A. Anchors: 30 lb self-drilling, drywall anchor.
- B. Screws: Coarse thread, drywall type, length as required by panel design and in accordance with Manufacturer's Installation Instructions.

2.4 SOURCE QUALITY CONTROL

- A. Fabrication Tolerances:
 1. Dimensions, length and width: $\pm 1/16$ inch.
 2. Thickness: $\pm 1/16$ inch.
 3. Weight: $\pm 1/2$ lb..

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Verify that substrate is a material listed as an acceptable substrate by the profile paneling manufacturer.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

- C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work by Installer is acceptance of substrate conditions.

3.2 INSTALLATION

- A. Install profile paneling in accordance with Manufacturer's Installation Instructions except that seam finishing shall be performed under Section 09 29 50 "Gypsum Board Systems," and sealing and painting shall be performed under Section 09 91 23 "Interior Painting."

3.3 PROTECTION

- A. Remove and replace that are wet, moisture damaged, or mold damaged.
- B. Protect finished work from damage during remainder of construction period.

END OF SECTION

SECTION 06 64 00
PLASTIC PANELING (“FRP”)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes plastic sheet paneling (“FRP”).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For plastic paneling and trim accessories.

1.3 QUALITY ASSURANCE

- A. Testing Agency: Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Composites, Inc.
 - b. Glasteel.
 - c. Marlite.
 - d. Nudo Products, Inc.
 - 2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 3. Nominal Thickness: Not less than 0.09 inch.
 - 4. Surface Finish and Color: As indicated on Drawings.

2.2 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
 - 1. Color: Match panels.
- B. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- C. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

3.2 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.
- D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION

SECTION 07 21 16.16
BLANKET INSULATION, FACED

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket insulation, faced.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Research reports.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Reinforced-Foil Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Guardian Building Products, Inc.
 - c. Johns Manville; a Berkshire Hathaway company.
 - d. Knauf Insulation.
 - e. Owens Corning.

2.2 ACCESSORIES

- A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
- B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to achieve indicated R-value.

3.2 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 faced blankets by taping flanges of insulation to flanges of metal studs.
 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.
- 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..

END OF SECTION

SECTION 07 21 29
SPRAYED INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes Spray applied acoustical insulation system.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature, specifications and application instructions.
- B. Quality Control Submittals: Submit manufacturer's certification that product meets or exceeds specified requirements.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturers: Company specializing in manufacturing products specified with minimum three years experience.
 - 2. Applicator: Three years documented experience in performing application of spray insulation materials; minimum of two projects with similar requirements; licensed by manufacturer of spray insulation materials.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency
- C. Mock-Ups:
 - 1. Install typical sample section of approximately 100 Sq. ft. on representative substrate for Architect review and to establish requirements for acoustical rating, thickness, density, and finish texture.
 - 2. Examine installation within one hour of completion to review variance due to shrinkage, temperature, and humidity.
 - 3. Where shrinking and cracking are evident, adjust mixture and method of application as recommended by manufacturer to meet required installation and fire rating requirements.
 - 4. Mockup may remain as part of Work.

1.4 PROJECT CONDITIONS

A. Environmental Requirements:

1. Maintain air and substrate temperature above 40 degrees F for 24 hours before, during and for 24 hours after application of spray insulation.
2. Provide ventilation to allow proper drying of spray insulation during and after application. Provide forced air circulation to vent poorly vented areas lacking natural ventilation.

1.5 WARRANTY

A. Special Warranty:

1. Submit warranty jointly signed by Contractor, manufacturer and installer.
2. Warranty shall state applied spray insulation will remain free from cracks, checking, dusting, flaking, spalling, separation and blistering for minimum two years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grace Construction Products
2. International Cellulose Corporation.
3. Isolatek International.
4. Thermacoustic.

2.2 MATERIALS

A. Acoustical Spray Insulation: Mineral fibers or cellulose, asbestos free, treated with binder adhesives and flame resistant materials, vermin and rat proof, completely free from biological degeneration.

1. Noise Reduction Coefficient: Minimum thickness of 2 inches, or as required to produce an NRC of 0.90.
2. Dry Density: 15 pounds/cu. ft. minimum
3. Fire Hazard Classification: Maximum flame-spread and smoke-developed indexes of 15 and 0, respectively, per ASTM E 84.
4. Combustibility: Noncombustible per ASTM E 136.
5. Air Erosion: No mass loss per ASTM E 859.
6. Fungus & Bacterial Resistance: No mold growth supported per ASTM G 21.

7. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cafco Sound-Shield by Isolatek International.
 - b. K-13 by International Cellulose Corporation.
 - c. Sonotex - 1 by Grace Construction Products.
 - d. Type TC-417-GP by Thermacoustic.
 8. Color: Black water soluble dye for integral color.
- B. Primers and Sealers: As recommended by manufacturer for job conditions.
 - C. Bonding Agent: As recommended by manufacturer.
 - D. Water: Clean, fresh, suitable for domestic consumption, free of mineral or organic substances which would affect set of spray insulation materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are clean, dry, and free of matter that may inhibit adhesion.
- B. Verify other work on and within spaces to be insulated is complete prior to application.
- C. Verify ducts, piping, conduit or other suspended equipment are not positioned until after application of sprayed insulation.

3.2 PREPARATION

- A. Mask and protect adjacent surfaces from overspray or damage.
- B. Apply primer as recommended by manufacturer.

3.3 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation to uniform monolithic density without voids.
- C. Tamp wet insulation surface to improve adhesion and to achieve smooth surface.

3.4 PROTECTION OF FINISHED WORK

- A. Do not permit subsequent construction work to disturb applied insulation.

3.5 ADJUSTING

- A. Patch areas where thickness of material is less than required under this Section.

3.6 CLEANING

- A. Remove overspray.

3.7 SCHEDULE

- A. Location: Underside of structure where indicated on Drawings.

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.2 ACTION SUBMITTALS

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

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

B. Product test reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by UL or a qualified testing agency acceptable to authorities having jurisdiction.

2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems bearing marking of qualified testing and inspection agency.
- C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Hilti, Inc.
 2. Specified Technologies Inc.
 3. 3M Fire Protection Products.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

- F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- D. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of

permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.4 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under "Firestop Systems."
- C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Interior joint sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.

1.4 WARRANTY

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

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 - 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 - 3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT – Type JS-1:
 - 1. Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals, LLC, Building Systems; Sonalastic TX1.
 - b. Pecora Corporation; Dynatrol I-XL.
 - c. Sika Corporation U.S.; Sikaflex Textured Sealant.
 - d. Tremco Incorporated; Dymonic.
- B. Urethane, S, NS, 25, T, NT – Type JS-2:
 - 1. Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
 - 2. Products: Subject to compliance with requirements, provide the following:
 - a. LymTal International, Inc.; Iso-Flex 330.
- C. Urethane, S, P, 25, T, NT – Type JS-3:
 - 1. Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals, LLC, Building Systems; Sonolastic SL 1.
 - b. Pecora Corporation; NR-201.
 - c. Sika Corporation U.S.; Sikaflex 1c SL.
 - d. Tremco Incorporated; Vulkem 45.

D. Urethane, M, NS, 25, T, NT – Type JS-4:

1. Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T and NT.
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; Chem-Calk 505.
 - b. LymTal International, Inc.; Iso-Flex 881.
 - c. Sika Corporation U.S.; Sikaflex - 2c NS EZ Mix.

2.3 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT – Type JS-5:

1. Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 786-M White.
 - b. GE Construction Sealants; SCS1700 Sanitary.
 - c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 100 WF.
 - d. Tremco Incorporated; Tremsil 200.

2.4 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealant, ASTM C 1311 – Type JS-6:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc; Chem-Calk 300.
 - b. Pecora Corporation; BC-158.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex – Type JS-7:

1. Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
 - b. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex 600 or Bondaflex Sil-A 700.
 - c. Pecora Corporation; AC-20.

- d. Sherwin-Williams Company (The); 850A or 950A.
- e. Tremco Incorporated; Tremflex 834.

2.6 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals, LLC, Building Systems.
 - b. Construction Foam Products, a division of Nomaco, Inc.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.7 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.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 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 laitance and form-release agents from concrete.
 - 2. 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.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. 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.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. 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.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in stone flooring.
 - c. Control and expansion joints in tile flooring.
 - d. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Type JS-2, JS-3, or JS-4.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of unit masonry and concrete walls and partitions.
 2. Joint Sealant: Type JS-1.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Type JS-7.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Other joints as indicated on Drawings.
 2. Joint Sealant: Type JS-5.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 2. Joint Sealant: Type JS-6.
 3. Joint-Sealant Color: As indicated by manufacturer's designations.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hollow-metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Amweld International, LLC.
 - 2. Ceco Door; ASSA ABLOY.
 - 3. Commercial Door & Hardware Inc.
 - 4. Curries Company; ASSA ABLOY.
 - 5. Deansteel Manufacturing Company, Inc.
 - 6. Door Components, Inc.
 - 7. Fleming Door Products Ltd.; ASSA ABLOY.
 - 8. Hollow Metal Xpress.
 - 9. Mesker Door Inc.
 - 10. National Custom Hollow Metal Doors & Frames.
 - 11. North American Door Corp.
 - 12. Pioneer Industries.
 - 13. Republic Doors and Frames.

14. Rocky Mountain Metals, Inc.
15. Steelcraft; an Allegion brand.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

- A. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core:
 - 1) Standard Door: Kraft-paper honeycomb, polystyrene, polyurethane, or mineral Board.
 - 2) Fire-Rated Door: Kraft-paper honeycomb or mineral board.
 - 3) Fire Rated Door with T-Rating: Mineral board.
 3. 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.
 4. Exposed Finish: Prime.

2.4 BORROWED LITES

- A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch.

- B. Construction: Full profile welded.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
- G. Glazing: Section 08 80 00 "Glazing."

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

- B. Hollow-Metal Doors:
1. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal 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 butt welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
 - 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.
- D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
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.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: SDI A250.10.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and 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.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. 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.
 5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb 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.
- B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- C. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops 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.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and

replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. 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.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

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SECTION 08 12 16
ALUMINUM FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior aluminum frames for doors installed in gypsum board partitions.
 - 2. Interior aluminum frames for glazing installed in gypsum board partitions.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For aluminum frames:
 - 1. Include elevations, sections, and installation details for each wall-opening condition.
- C. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advanced Architectural Frames.
 - 2. Alpha Aluminum Products, Inc.
 - 3. Dual Lock Partition Systems, Inc.; Avalon International Aluminum.
 - 4. Frameworks, Inc.; an ASSA ABLOY Group company.
 - 5. RACO Interior Products, Inc.
 - 6. Versatrac Frames; a division of American Door Products Inc.
 - 7. Wilson Partitions; a division of Acradia, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Frames: Frames for fire-rated door assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Frames for Smoke- and Draft-Control Assemblies: Tested according to UL 1784 and installed in compliance with NFPA 105.
 - a. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg.

2.3 COMPONENTS

- A. Aluminum Framing: ASTM B 221, with alloy and temper required to suit structural and finish requirements, and not less than 0.062 inch thick.
- B. Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers.
- C. Glazing Frames: Extruded aluminum, for indicated glass thickness.
- D. Door Tracks: Extruded aluminum where exposed, sized to enclose sliding-door hardware, and in finish matching frame and trim finish.
- E. Trim: Extruded aluminum, not less than 0.062 inch thick; removable, snap-in casing trim and glazing stops, without exposed fasteners.
 1. Trim Style: As indicated on Drawings.
- F. Frame and Trim Finish: From the following options as indicated on Drawings:
 1. Clear-anodized aluminum.
 2. Color-anodized aluminum.
 - a. Color: As selected by Architect from manufacturer's full range.
 3. Factory-applied, baked-enamel or powder-coat finish.
 - a. Color: As selected by Architect from manufacturer's full range.

2.4 ACCESSORIES

- A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.
- B. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals in color approximating frame color.
- C. Smoke Seals: Intumescent strip or fire-rated gaskets in color approximating frame color.
- D. Glazing Gaskets: Manufacturer's standard extruded or molded rubber or plastic, to accommodate glazing thickness indicated; in color approximating frame color.
- E. Glass: As specified in Section 08 80 00 "Glazing."

- F. Door Hardware: As specified in Section 08 71 00 "Door Hardware."

2.5 FABRICATION

- A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted and mitered connections.
- B. Factory prepare aluminum frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Door Hardware."
 - 1. Locate hardware cutouts and reinforcements as required by fire-rated label for assembly.
- C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
 - 1. Locate removable stops on the inside of spaces accessed by keyed doors.
- D. Fabricate components to allow secure installation without exposed fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install aluminum frames plumb, rigid, properly aligned, and securely fastened in place; according to manufacturer's written instructions.
 - 1. At fire-protection-rated openings, install fire-rated frames according to NFPA 80 and NFPA 105.
- B. Install frame components in the longest possible lengths with no piece less than 48 inches; components 96 inches or shorter shall be one piece.
- C. Glass: Install glass according to Section 08 80 00 "Glazing" and aluminum-frame manufacturer's written instructions.
- D. Doors: Install doors aligned with frames and fitted with required hardware.
- E. Door Hardware: Install according to Section 08 71 00 "Door Hardware" and aluminum-frame manufacturer's written instructions.

3.2 ADJUSTING

- A. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended in writing by frame manufacturer and according to AAMA 609 and 610.

- B. Touch Up: Repair marred frame surfaces to blend inconspicuously with adjacent unrepaired surface so touchup is not visible from a distance of 48 inches as viewed by Architect. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing and shop priming of flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

C. Samples: For factory-finished doors.

1.3 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.

3. Graham Wood Doors; an Assa Abloy Group company.
4. Ipik Door Company.
5. Marshfield Door Systems, Inc.
6. Oshkosh Door Company.
7. VT Industries, Inc.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.
- D. WDMA I.S.1-A Performance Grade:
 1. Heavy Duty unless otherwise indicated.
 2. Extra Heavy Duty: Public toilets, janitor's closets, assembly spaces, exits, and patient rooms.
 3. Standard Duty: Closets (not including janitor's closets) and private toilets.
- E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
- F. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- G. Particleboard-Core Doors:
 1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 3. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- H. Structural-Composite-Lumber-Core Doors:
 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.

b. Screw Withdrawal, Edge: 400 lbf.

I. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom (Grade A faces).
2. Species: As indicated on Drawings.
3. Cut: As indicated on Drawings.
4. Match between Veneer Leaves: Book match, unless otherwise indicated.
5. Assembly of Veneer Leaves on Door Faces: Running match, unless otherwise indicated.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Core: Particleboard, except where indicated otherwise for fire-rating and/or hardware mounting requirements.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom.
2. Faces: Any closed-grain hardwood of mill option.
3. Core: Particleboard, except where indicated otherwise for fire-rating and/or hardware mounting requirements.
4. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.5 LIGHT FRAMES AND LOUVERS

- A. 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. Include

concealed metal glazing clips where required for opening size and fire-protection rating indicated.

B. Metal Louvers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Louvers, Inc, a Division of the Activar Construction Products Group.
 - b. Anemostat Products; a Mestek company.
 - c. L & L Louvers, Inc.
 - d. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - e. McGill Architectural Products.
2. Metal and Finish: Match door frame.

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
- 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."
 3. Louvers: Factory install louvers in prepared openings.

2.7 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 09 91 23" Interior Painting."

2.8 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors that are indicated to receive transparent finish.

- C. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: WDMA TR-4 conversion varnish or WDMA TR-6 catalyzed polyurethane.
 - 3. Staining: Match Architect's sample.
 - 4. Effect: Open finish for open-grain woods. Wash coat for closed-grain woods.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
 - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/4 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
- 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.

END OF SECTION

SECTION 08 14 33
STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior stile and rail wood doors.
2. Interior fire-rated, stile and rail wood doors.
3. Finishing stile and rail wood doors.
4. Fitting stile and rail wood doors to frames and machining for hardware.

1.2 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Shop Drawings:** For stile and rail wood doors. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and other pertinent data.
- C. Samples:** Represent typical range of color and grain for each species of veneer and solid lumber required. Finish Sample with same materials proposed for factory-finished doors.

1.3 INFORMATIONAL SUBMITTALS

- A. Quality Standard Compliance Certificates:** AWI Quality Certification Program certificates.

PART 2 - PRODUCTS

2.1 MATERIALS

1. **General:** Use only materials that comply with referenced standards and other requirements specified. Assemble exterior doors and sidelites with wet-use adhesives.
- B. Adhesives:** Do not use adhesives that contain urea formaldehyde.
- C. Composite Wood Products:** Products shall be made without urea formaldehyde.

2.2 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Wood Doors: Interior custom doors complying with WDMA I.S.6A, "Industry Standard for Architectural Stile and Rail Doors," and with other requirements specified.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Algoma Hardwoods, Inc.
 - b. Belentry Doors LLC.
 - c. Dimension Millworks.
 - d. Eggers Industries.
 - e. Maiman Company (The).
 - f. Marshfield DoorSystems, Inc.
 - g. Pinecrest Inc.
 - h. VT Industries Inc.
 2. Grade: Custom.
 3. Finish: Transparent or opaque, as indicated on Drawings.
 4. Wood Species and Cut:
 - a. Transparent Finish: As indicated on Drawings.
 - b. Opaque Finish: Mill option.
 5. Door Construction for Transparent Finish:
 - a. Stile and Rail Construction: Veneered, structural composite lumber or veneered, edge- and end-glued clear lumber.
 - b. Raised-Panel Construction: Veneered, wood-based panel product with mitered, raised rims made from matching clear lumber.
 - c. Flat-Panel Construction: Veneered, wood-based panel product.
 6. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction: Veneered, structural composite lumber or veneered edge- and end-glued lumber.
 - b. Raised-Panel Construction: Shaped, medium-density fiberboard.
 - c. Flat-Panel Construction: Medium-density fiberboard.
 7. Raised-Panel Thickness: 1-1/8 inches.
 8. Flat-Panel Thickness: 1/2 inch.
 9. Glass: Uncoated, clear, fully tempered float glass, 5.0 mm thick, complying with Section 08 80 00 "Glazing."

2.3 INTERIOR FIRE-RATED, STILE AND RAIL WOOD DOORS

- A. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- C. Interior Fire-Rated Stile and Rail Wood Doors: Fire-rated (20-minute rating) doors complying with WDMA I.S.6A, "Industry Standard for Architectural Stile and Rail Doors," and with other requirements specified.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Algoma Hardwoods, Inc.
 - b. Belentry Doors LLC.
 - c. Dimension Millworks.
 - d. Eggers Industries.
 - e. Maiman Company (The).
 - f. Marshfield DoorSystems, Inc.
 - g. Pinecrest Inc.
 - h. VT Industries Inc.
 2. Grade: Custom.
 3. Finish: Transparent or opaque, as indicated on Drawings.
 4. Wood Species and Cut:
 - a. Transparent Finish: As indicated on Drawings.
 - b. Opaque Finish: Mill option.
 5. Door Construction for Transparent Finish: 1-3/4-inch-thick stiles and rails and veneered flat panels not less than 5/8 inch thick and raised panels not less than 1-1/8 inches thick.
 - a. Stile and Rail Construction: Veneered, structural composite lumber. Select veneers for similarity of grain and color, and arrange for optimum match between adjacent pieces. Use veneers not less than 1/16 inch thick.
 - b. Raised-Panel Construction: Veneered, shaped, wood-based panel product with veneer conforming to raised-panel shape.
 - c. Flat-Panel Construction: Veneered, wood-based panel product.
 6. Door Construction for Opaque Finish: 1-3/4-inch-thick stiles and rails and veneered flat panels not less than 5/8 inch thick and raised panels not less than 1-1/8 inches thick.
 - a. Stile and Rail Construction: Veneered, structural composite lumber.
 - b. Raised-Panel Construction: Shaped, medium-density fiberboard.
 - c. Flat-Panel Construction: Medium-density fiberboard.

- D. Interior Fire-Rated Stile and Rail Wood Doors: Fire-rated (45-minute rating) doors complying with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards," and with other requirements specified.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Algoma Hardwoods, Inc.
 - b. Belentry Doors LLC.
 - c. Dimension Millworks.
 - d. Eggers Industries.
 - e. Maiman Company (The).
 - f. Marshfield DoorSystems, Inc.
 - g. Pinecrest Inc.
 - h. VT Industries Inc.
 2. Grade: Custom.
 3. Finish: Transparent or opaque, as indicated on Drawings.
 4. Wood Species and Cut:
 - a. Transparent Finish: As indicated on Drawings.
 - b. Opaque Finish: Mill option.
 5. Interior Fire-Rated Door Construction: 1-3/4-inch-thick, edged and veneered mineral-core stiles and rails and 1-1/8-inch-thick, veneered mineral-core raised panels.
 6. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.4 STILE AND RAIL WOOD DOOR FABRICATION

- A. Fabricate stile and rail wood doors in sizes indicated for field fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:
 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide not more than 3/8 inch from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 3. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- C. Factory machine doors for hardware that is not surface applied.

- D. Glazed Openings: Factory install glazing in doors, complying with Section 08 80 00 "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood moldings. Miter wood moldings at corner joints.
- E. Transom and Side Panels: Fabricate panels to match adjoining doors in materials, finish, and quality of construction.
- F. Prehung Doors: Provide stile and rail doors complete with frames, and hardware.
 - 1. Provide wood door frames that comply with Section 06 20 23 "Interior Finish Carpentry."
 - 2. Provide hardware that complies with Section 08 71 00 "Door Hardware."

2.5 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 09 91 23 "Interior Painting."

2.6 FINISHING

- A. Finish wood doors at factory that are indicated to receive transparent finish.
- B. For doors indicated to be shop finished, comply with WDMA I.S.6A, "Industry Standard for Architectural Stile and Rail Doors," and with other requirements specified.
- C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: WDMA TR-4 conversion varnish or WDMA TR-6 catalyzed polyurethane.
 - 3. Staining: Match Architect's sample.
 - 1. Effect: Open finish for open-grain woods. Wash coat for closed-grain woods.
 - 2. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/4 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 3. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Acudor Products, Inc.
 2. Babcock-Davis.
 3. Cendrex Inc.
 4. JL Industries, Inc.; a division of the Activar Construction Products Group.
 5. Karp Associates, Inc.
 6. Larsens Manufacturing Company.
 7. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 8. Nystrom, Inc.

2.3 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges:
 1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
 2. Locations: Walls and ceilings in non-public, back-of-house spaces.
 3. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.

4. Frame Material: Same material, thickness, and finish as door.
5. Latch and Lock: Cam latch, screwdriver operated.

B. Flush Access Doors with Concealed Flanges:

1. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
2. Locations: Walls and ceilings of public spaces.
3. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
4. Frame Material: Same material and thickness as door.
5. Latch and Lock: Cam latch, screwdriver operated.

2.4 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge.
2. Locations: Walls and ceilings in non-public, back-of-house spaces.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
5. Frame Material: Same material, thickness, and finish as door.
6. Latch and Lock: Self-latching door hardware, operated by key.

B. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
2. Locations: Walls and ceilings of public spaces.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
5. Frame Material: Same material, thickness, and finish as door.
6. Latch and Lock: Self-closing, self-latching door hardware, operated by key.

2.5 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Frame Anchors: Same material as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.6 FABRICATION

- A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- C. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Keys: Furnish two keys per lock and key all locks alike.

2.7 FINISHES

- A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

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SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Acudor Products, Inc.
 2. Babcock-Davis.
 3. Cendrex Inc.
 4. JL Industries, Inc.; a division of the Activar Construction Products Group.
 5. Karp Associates, Inc.
 6. Larsens Manufacturing Company.
 7. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 8. Nystrom, Inc.

2.3 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges:
 1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
 2. Locations: Walls and ceilings in non-public, back-of-house spaces.
 3. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.

4. Frame Material: Same material, thickness, and finish as door.
5. Latch and Lock: Cam latch, screwdriver operated.

B. Flush Access Doors with Concealed Flanges:

1. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
2. Locations: Walls and ceilings of public spaces.
3. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
4. Frame Material: Same material and thickness as door.
5. Latch and Lock: Cam latch, screwdriver operated.

2.4 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge.
2. Locations: Walls and ceilings in non-public, back-of-house spaces.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
5. Frame Material: Same material, thickness, and finish as door.
6. Latch and Lock: Self-latching door hardware, operated by key.

B. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
2. Locations: Walls and ceilings of public spaces.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
5. Frame Material: Same material, thickness, and finish as door.
6. Latch and Lock: Self-closing, self-latching door hardware, operated by key.

2.5 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Frame Anchors: Same material as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.6 FABRICATION

- A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- C. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Keys: Furnish two keys per lock and key all locks alike.

2.7 FINISHES

- A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

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SECTION 08 34 73.16

WOOD SOUND CONTROL DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes wood sound control door assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sound control door assemblies. Include elevations, details, seals, anchorages, and accessories.
- C. Samples: For units with factory-applied finishes.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.

1.4 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sound control door assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. STC Rating: As indicated on Drawings as calculated by ASTM E 413 when tested in an operable condition according to ASTM E 90.

2.2 WOOD SOUND CONTROL DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. AMBICO Limited.
 - 3. Eggers Industries.
 - 4. Graham Wood Doors; an Assa Abloy Group company.
 - 5. Ipik Door Company
 - 6. Krieger Specialty Products Company.
 - 7. Marshfield DoorSystems, Inc.
 - 8. Oshkosh Door Company.
 - 9. Overly Door Company.
 - 10. Security Acoustics.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.
- D. Doors: Flush-design sound control doors, thickness as required to provide STC rating; with manufacturer's standard sound-retardant core as required to provide STC rating indicated. Fabricate according to WDMA 1.S.1-A.
- E. Glazing: Manufacturers' standard factory-installed glazing.
- F. Materials: Comply with Section 08 14 16 "Flush Wood Doors" for grade, faces, veneer matching, fabrication, finishing, and other requirements unless otherwise indicated.
- G. Finishes:
 - 1. Factory finish sound control wood doors to match doors specified in Section 08 14 16 "Flush Wood Doors."

2.3 SOUND CONTROL FRAMES

- A. Frames: Fabricate sound control door frames with corners mitered, reinforced, and continuously welded the full depth and width of frame. Fabricate according to NAAMM-HMMA 865.
 - 1. Weld frames according to NAAMM-HMMA 820.
 - 2. Interior Frames: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.075-inch nominal thickness or thicker as required to provide STC rating indicated.
 - 3. Hardware Reinforcement: Fabricate according to NAAMM-HMMA 865 of same material as face sheets.
- B. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
2. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B.
3. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

C. Finishes:

1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

2.4 HARDWARE

A. Sound Control Door Hardware: Manufacturer's standard sound control system, including head and jamb seals, door bottoms, cam-lift hinges, and thresholds, as required by testing to achieve STC and fire rating indicated.

1. Compression Seals: One-piece units consisting of closed-cell sponge neoprene or silicone seal held in place by metal retainer, with retainer cover of same material as door frame; attached to door frame with concealed screws.
2. Magnetic Seals: One-piece units consisting of closed-cell sponge neoprene seal and resiliently mounted magnet held in place by metal retainer, with retainer cover of same material as door frame; attached to door frame with concealed screws.
3. Automatic Door Bottoms: Neoprene or silicone gasket, held in place by metal housing, that automatically drops to form seal when door is closed; mounted to bottom edge of door with screws.
4. Cam-Lift Hinges: Full-mortise template type that raises door 1/2 inch when door is fully open; with hardened pin; fabricated from stainless steel.
5. Thresholds: Flat, smooth, unfluted type as recommended by manufacturer; fabricated from solid wood matching wood door faces.

B. Other Hardware: Comply with requirements in Section 08 71 00 "Door Hardware."

2.5 FABRICATION

A. Wood Sound Control Door Fabrication: Factory fit doors to suit frame-opening sizes indicated, with uniform clearances and bevels according to WDMA I.S.1-A unless otherwise indicated. Comply with final door hardware schedules and hardware templates.

1. Glazed Lites: Factory install glazed lites according to requirements of tested assembly to achieve STC rating indicated.
2. Locate door hardware as indicated, or if not indicated, according to DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - a. Coordinate measurements of hardware mortises in steel frames to verify dimensions and alignment before factory machining.

B. Sound Control Frame Fabrication:

1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Anchors: Provide number and spacing of anchors as indicated in NAAMM-HMMA 865.
 - a. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
4. Hardware Preparation: Factory prepare sound control frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
 - a. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.
5. Tolerances: Fabricate frames to tolerances indicated in NAAMM-HMMA 865.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Frames: Install sound control door frames in sizes and profiles indicated.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, and dress; make splice smooth, flush, and invisible on exposed faces.
 - b. Install sound control frames with removable glazing stops located on secure side of opening.
 - c. Remove temporary braces only after frames or bucks have been properly set and secured.
 - d. Check squareness, twist, and plumbness of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - e. Apply corrosion-resistant coating to backs of frames to be filled with mortar, grout, and plaster containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
3. Metal-Stud Partitions: Fully fill frames with mineral-fiber insulation.

4. 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.
 5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
 7. Installation Tolerances: Adjust sound control door frames for squareness, alignment, twist, and plumbness to the following tolerances as indicated in NAAMM-HMMA 865.
- B. Doors: Fit sound control doors accurately in frames, within clearances as indicated in NAAMM-HMMA 865.
- C. Sound Control Seals: Where seals have been factory prefit and preinstalled and subsequently removed for shipping, reinstall seals and adjust according to manufacturer's written instructions.
- D. Cam-Lift Hinges: Install hinges according to manufacturer's written instructions.
- E. Thresholds: Set thresholds in full bed of sealant complying with requirements in Section 07 92 00 "Joint Sealants."
- F. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with sound control door assembly manufacturer's written instructions.

END OF SECTION

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SECTION 08 70 11

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hardware for swinging and sliding wood and hollow metal doors and gates.
2. Hardware for aluminum doors.
3. Thresholds.
4. Weatherstripping, seals and door gaskets.

1.2 REFERENCE STANDARDS

A. Fire/Life Safety

1. NFPA - National Fire Protection Association
2. NFPA 70 – National Electric Code
3. NFPA 80 - Standard for Fire Doors and Fire Windows
4. NFPA 101 - Life Safety Code
5. NFPA 105 - Smoke and Draft Control Door Assemblies
6. UL - Underwriters Laboratories
7. UL 10C - Positive Pressure Test of Fire Door Assemblies
8. UL 1784 - Air Leakage Tests of Door Assemblies

B. Accessibility

1. ADA/TAS - Americans with Disabilities Act /Texas Accessibility Standards.
2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

C. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware

D. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties
2. BHMA 1301 - Materials and Finishes.

1.3 SUBMITTALS

A. Hardware Schedule:

1. Submit hardware supplier's typewritten copies of proposed finish hardware schedule for review.
2. Prepare schedule using Sequence and Format for Hardware Schedule as recommended by Door and Hardware Institute (DHI).
3. After acceptance of schedule, provide schedule to Architect for file and distribution purposes.
4. DO NOT order hardware until acceptable schedule has been received.

B. Product Data:

1. Manufacturer's cut sheets for each hardware item.
2. Details for type strike plates, length of spindle, hand, backset and bevel of locks, hand and degree of opening for closers and other functions of mechanisms.
3. Installation instructions and maintenance information.

1 4. Copies of final hardware schedule reflecting changes made during construction.
2

3 C. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit details of
4 electrified door hardware, indicating the following:

- 5 1. Wiring Diagrams: For power, signal, and control wiring and including the following:
6 a. Details of interface of electrified door hardware and building safety and security systems.
7 b. Schematic diagram of systems that interface with electrified door hardware.
8 c. Point-to-point wiring.
9 d. Risers.

10
11 D. Shop Drawings:

- 12 1. Push Plate: Indicate concealed fastening and graphics.
13 2. Thresholds: Indicate thickness of materials, method of anchoring and details of construction.
14

15 E. Samples:

- 16 1. Provide Architect one sample of each item of finish hardware to be furnished for Project.
17 2. Samples will be held by Architect until completion of Project.
18 3. Upon completion of Project, Architect will return samples to Supplier turn over samples to
19 Owner to serve as product samples for Owner's building maintenance department.
20

21 F. Certifications: Upon request of Architect, submit hardware manufacturer's letter of compliance that
22 products meet ANSI requirements and have been tested and are grades required by specification.
23

24 G. Templates: Furnish templates and accepted finish hardware schedule to door and frame
25 manufacturers for use in fabrication.
26

27 H. Maintenance Tools: Deliver hardware adjustment tools for each item of finish hardware.
28

29 I. Operation and Maintenance Data: Provide manufacturer's parts list and maintenance instructions for
30 each type of hardware supplied and necessary wrenches and tools required for proper maintenance of
31 hardware.
32

33 1.4 QUALITY ASSURANCE 34

35 A. Manufacturer's Representative: Furnish services of Architectural Hardware Consultant to prepare
36 hardware schedule, keying, coordination with other trades, consultation with Architect and Owner,
37 and on-site inspections.
38

39 B. Single Source Responsibility: Obtain each type of door hardware from a single manufacturer.

- 40 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless
41 otherwise indicated.
42 2. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting
43 agency acceptable to authorities having jurisdiction are acceptable.
44

45 C. Fire Resistant Hardware: Comply with requirements of door and frame manufacturer for UL listed
46 assembly; bear UL labels.
47

48 D. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.

- 49 1. Attendees: Owner, Contractor, Architect, Installer, Supplier's Architectural Hardware Consultant.

2. 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.
 - d. Requirements for access control.
 - e. Address for delivery of keys.

- E. Pre-installation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades. Inspect and discuss electrical roughing-in for electrified door hardware.
 3. Review sequence of operation for each type of electrified door hardware.
 4. Review required testing, inspecting, and certifying procedures.

F. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold a meeting for the purpose of reviewing any questions or concerns related to the proper installation and adjustment of door hardware.
2. Attendees: doors hardware supplier, door hardware installer, Contractor.
3. After the meeting, provide letter of compliance to the Architect, indicating when the meeting was held and who was in attendance.

G. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold a meeting for the purpose of coordinating door hardware with security, electrical, doors and frames, and other related suppliers.

1. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Architect and Contractor.
2. After meeting, provide letter of compliance to the Architect, indicating when the coordination conference was held and who was in attendance.

H. Windstorm Requirements:

1. All exterior doors and hardware to meet the requirements of the Texas Department of Insurance – with a wind speed of 135 MPH (3 second wind gust). This project must pass a Texas Windstorm WP1 inspection. The contractor is to provide all engineering and documentation for affected building systems. The bids are to include all such design, engineering, and documentation for submittal to the Architect, as well as for City and State review and inspections. All exterior door hardware to be as specified in the Texas Department of Insurance Evaluation report for each respective door.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Package hardware items separately with necessary screws, bolts, miscellaneous parts, instructions, and where necessary, installation templates for installation. Clearly label packages to identify contents and finish location in building.
- B. Deliver hardware required for shop application to shop, mill or factory in ample time to not impede progress of work.

- 1 C. Receive hardware when delivered. Provide dry, secure lock-up for hardware delivered to project, but
2 not yet installed. Provide space for unpacking, sorting, checking and storage of finish hardware.
3
- 4 D. Control handling and installation of hardware items which are not immediately replaceable so
5 completion of work will not be delayed by hardware losses, both before and after installation.
6
- 7 E. Contractor and hardware supplier shall jointly inventory.
8

9 1.6 WARRANTY

- 10 A. Submit additional warranty on following items:
11 1. Mortise Locks:
12 a. Mechanical: 3 year limited
13 b. Electrified: 1 year limited
14 2. Door Closers: 30 year limited
15 3. Exit Devices:
16 a. Mechanical: 3 year limited
17 b. Electrified: 1 year limited
18
19

20 PART 2 PRODUCTS

21 2.1 BUTT HINGES

- 22 A. Acceptable Manufacturers:
23 1. Ives
24 2. Hager Hinge Company.
25 3. McKinney Manufacturing Company.
26
27
- 28 B. Full Mortise Hinges: Five knuckle, ANSI A156.1, with non-rising pins, ball bearing on doors with
29 closers and plain bearing on other doors.
30
- 31 C. Non-Removable Pins: Provide butts with set screw in barrel making hinge non-removable when door
32 is in closed position for exterior and interior reverse beveled doors with locking functions.
33
- 34 D. Heavyweight Ball Bearing Hinges: Labeled doors over 8'-0" in height, unless doors are labeled with
35 standard weight ball bearing hinges.
36
37
- 38 E. Follow manufacturer's recommendations for quantity, width, height and thickness.
39
- 40 F. Wide Throw Hinges: Where necessary to clear trim or obstacles.
41
- 42 G. Provide quick connect connectors for all thru wire functions as specified.
43

44 2.2 CONTINUOUS HINGES

- 45 A. Acceptable Manufacturers:
46 1. Ives
47 2. Hager Hinge Company.
48 3. Zero
49
- 50 B. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 2.
- 51 C. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
- D. Provide quick connect connectors for all thru wire functions as specified.

1
2 2.3 LOCKSETS AND LATCH SETS
3

4 A. Acceptable Manufacturers:

- 5 1. Schlage Lock Company.
6 2. Sargent
7 3. Best
8

9 B. Mortise Locks and Latch Sets:

- 10 1. Heavy duty construction with wrought cases, minimum case thickness of 0.093", ANSI A156.13.
11 2. Fronts: 8" x 1-1/4", adjustable to 1/8" in 2" with 2-3/4" backset.
12 3. Minimum projection of latch bolt: 3/4".
13 4. Minimum throw of dead bolt: 1".
14

15 C. Lever Handles and Escutcheons:

- 16 1. Cast of forged brass or bronze material, levers supported by independent springs.
17 2. On doors into hazardous areas which are accessible to physically handicapped persons, provide
18 knurled lever contact surfaces.
19 3. Lever to return with 1/2" of the face of the door.
20

21 D. Strikes:

- 22 1. Furnish locks and latches with wrought box strikes.
23 2. On single swing doors, provide latch strike plates with minimum lip projection necessary to
24 project from trim.
25 3. On pair of doors with or without astragal, lip projection of latch strike plates shall not extend
26 beyond face of lock style of inactive leaf.
27 4. Size: 4-7/8" x 1-1/4" x 3/32".
28

29 E. Electrical Functions:

- 30 1. Provide integral request to exit switch where specified.
31 2. Voltage: 24VDC
32 3. Fail safe and fail secure functions shall be field selectable.
33 4. Provide quick connect connectors for all electrified functions.
34

35 F. Basis of Design:

- 36 1. Schlage L9000 Series, 17 Lever
37

38 2.4 KEYING

39 A. Factory construction masterkeyed locksets based on SFIC Schlage cylinders. Perform further keying
40 as directed by Owner.
41

42 B. Acceptable Manufacturers:

- 43 1. Schlage Lock Company.
44 2. Sargent
45 3. Best
46

47 C. Establish keying based on GMK system. Provide following number of keys:

- 48 1. GMK: 10 each.
49 2. MK: 40 each.
50 3. Change keys: Three for each lock.
51 4. Construction keys: 20 master keys. Final Number to be determined by Contractor

- 1 5. Construction control keys: 20 each.
2 6. The quantities listed above are for bidding purposes only. Final quantities shall be determined at
3 keying meeting. Remaining keys shall be provided as blanks for Owner's stock.
4

5 D. Construction Keying: Provide keyed construction cores for locks during construction.
6

7 E. Index, tag and deliver permanent keys in sealed container to Owner.
8

9 F. Contractor to provide removal of temporary core and installation of permanent cores.
10

11 2.5 SURFACE MOUNTED DOOR CLOSERS 12

13 A. Acceptable Manufacturers:
14

- 15 1. LCN Closer Division. 4040XP
- 16 2. Sargent 281
- 17 3. Corbin Russwin DC8000
18

19 B. Description:
20

- 21 1. ANSI A156.4.
- 22 2. Cast iron rack and pinion construction with compression spring, fully hydraulic.
- 23 3. Pressure relief valves will not be accepted.
- 24 4. Closing speed, latching speed and backcheck controlled by independently operated concealed key
25 valves.
- 26 5. Intensity of backcheck feature to be adjustable.
- 27 6. Equipped with spring adjustment allowing adjustment of spring power to suit individual door
28 conditions.
- 29 7. Size as recommended by manufacturer for door size and weight.
- 30 8. Provide mounting plates, hex nuts and bolts.
- 31 9. No graphics allowed on cover.
- 32 10. Provide parallel arms for exterior doors, hall doors, and outswinging interior doors.
- 33 11. Provide stop arms for exterior door closers with parallel arms.
- 34 12. Provide all parallel arm applications with forged extra duty arm
- 35 13. For doors in areas accessible to physically handicapped persons, provide doors with adjustable
36 opening force and delayed closing actions.

37 C. Finish
38

- 39 1. Provide factory finished powder coated covers and arms.
- 40 2. Provide custom colors where specified.
41

42 2.6 DOOR STOPS 43

44 A. Acceptable Manufacturers:
45

- 46 1. ABH.
- 47 2. Glynn-Johnson.
- 48 3. Ives.
- 49 4. Trimco.
- 50 5. Hager

51 B. Wall Stops: Convex gray rubber bumper and brass, bronze or steel with concealed fasteners.

- 1 C. Furnish door stop for all door leaves.
- 2
- 3 D. Overhead stop: provide where conditions require.
- 4

5 2.7 FLUSH BOLTS AND STRIKES

- 6

- 7 A. Acceptable Manufacturers:
 - 8 1. Baldwin.
 - 9 2. Builder's Brass Works.
 - 10 3. Ives.
 - 11 4. Trimco.
 - 12
- 13 B. Furnish flush bolts with dustproof strikes.
- 14

15 2.8 SILENCERS

- 16

- 17 A. Acceptable Manufacturers:
 - 18 1. Baldwin.
 - 19 2. Builder's Brass Works.
 - 20 3. Glynn-Johnson.
 - 21 4. Trimco.
 - 22
- 23 B. Description: Preformed neoprene or rubber, gray.
- 24
- 25 C. Provide on interior metal door frames, except for frames for weatherstripped or smoke-sealed doors.
- 26 Provide three silencers minimum for single doors and two for pairs of doors.
- 27

28 2.9 AIR OR SMOKE SEALS

- 29

- 30 A. Extruded silicone bulb-type with self-adhesive backing.
- 31

32 2.10 WEATHER STRIPPING

- 33

- 34 A. Type: Silicone head and jamb pressure-sensitive gasket.
- 35 B. Provide bar stock type where specified.
- 36

37 2.11 THRESHOLD

- 38

- 39 A. Acceptable Manufacturers:
 - 40 1. National Guard Products
 - 41 2. Pemko Manufacturing Company.
 - 42 3. Reese Metal Weatherstripping Company.
 - 43 4. Zero Weatherstripping Company, Inc.
 - 44
- 45 B. Provide type as specified. Refer to drawings for special sill conditions.
- 46

47 2.12 DOOR BOTTOM SEAL

- 48

- 49 A. Material: Neoprene in aluminum channel.
- 50
- 51 B. Acceptable Manufacturers:

- 1 1. National Guard Products.
- 2 2. Pemko Manufacturing Company.
- 3 3. Reese Metal Weatherstripping Company.
- 4 4. Zero Weatherstripping Company, Inc.

5
6 2.13 PUSH AND PULLS

7
8 A. Acceptable Manufacturers:

- 9 1. Ives.
- 10 2. Rockwood.
- 11 3. Trimco Builders Hardware.

12
13 2.14 KICK PLATES

14
15 A. Acceptable Manufacturers:

- 16 1. Ives.
- 17 2. Hiawatha, Inc.
- 18 3. McKinney.
- 19 4. Trimco Builders Hardware.
- 20 5. Baldwin Hardware Manufacturing Corporation.

21
22 2.15 MISC ELECTRICAL ITEMS

23
24 A. Quick Connect Wire Harnesses

- 25 1. Provide all quick connect harness in the length specified.
- 26 2. Number of wires to match specified product.
- 27 3. Quick connectors for all products shall be factory installed.

28
29 B. Accessories

- 30 1. Provide power supplies for panic hardware where specified. Power supply to be provided by exit device manufacturer.

31
32
33 2.16 KEY CABINET

34
35 A. Surface mounted unit manufactured from patent level cold-rolled furniture steel, electro-welded construction; no sag continuous piano type pin hinge; pin tumbler locking device.

36
37
38 B. Index system including dual tag system, visible key receipt system, three-way visible index and key gathering envelopes.

39
40
41 C. Sized to contain and index keys for project plus 100 percent expansion.

42
43 2.17 FABRICATION

44
45 A. Form surfaces true, smooth, and free from burrs; of uniform color, reasonably free from imperfections affecting appearance and serviceability. Dress portions of lock mechanism which come in contact or bear upon other parts to true, smooth surface.

46
47
48
49 B. Drawings show swing or hand of each door. Finish each item of hardware for proper installation and operation of door swing.

- 1 C. Manufacture hardware to conform to published templates, ANSI A156.7, and prepared for machine
2 screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal
3 screws except as specifically indicated.
4
5 D. Furnish screws for installation with each hardware item. Provide Phillips flathead screws except as
6 otherwise noted. Finish exposed screws to match hardware finish.
7
8 E. Provide concealed fasteners for hardware units which are not exposed when door is closed, except to
9 extent no standard manufacturer units of type specified are available with concealed fasteners.
10
11 F. Provide appropriate nuts and thru-bolts with closers.
12
13 G. Provide fasteners which are compatible with bolt unit fastened and substrate, and which will not cause
14 corrosion or deterioration of hardware, base material, or fastener.
15

16 2.18 HARDWARE FINISHES

- 17
18 A. Match finish of each hardware unit at each door or opening. Reduce differences in color and textures
19 as much as possible where base metal or metal forming process is different for individual units of
20 hardware exposed at same door or opening.
21
22 B. Architect will determine of acceptability of match with samples and other hardware at each door.
23 Units will be judged when held 2'-0" apart at 3'-0" distance.
24
25 C. Finish designations used in schedules and elsewhere are those listed in Materials and Finished
26 Standard 1301 by BHMA.
27
28

29 PART 3 EXECUTION

30 3.1 PREPARATION

- 31
32
33 A. Hardware schedule should include thicknesses of door, hand and backset of hardware items, method
34 of fastening and other detail requirements.
35
36 B. Check Drawings and door schedule and provide required hardware for openings. Provide required
37 hardware for labeled opening to conform with NFPA 80 and applicable building codes.
38
39 C. Coordinate with door and frame manufacturers.
40
41 D. Trim undesignated openings with hardware of equal quality and design to that specified for similar
42 opening.
43

44 3.2 INSTALLATION

- 45
46 A. Install finish hardware plumb, level and true to line in accordance with manufacturer's printed
47 instructions and job conditions.
48
49 B. Locate hardware to comply with NBHA standards.
50
51 C. Install finish hardware to template.

- 1
2 D. Cut and fit to substrate avoiding damage or weakening. Reinforce attachment substrates as necessary
3 for installation and operation.
4
5 E. Completely cover cutouts with hardware item.
6
7 F. Mortise work to correct location and size without gouging, splintering or causing irregularities in
8 exposed finish work.
9
10 G. Surfaces for paint or other finish:
11 1. Where cutting and fitting is required on substrates to be painted or similarly finished, install, fit
12 and adjust hardware prior to finishing.
13 2. Remove hardware and place in original packaging.
14 3. Reinstall hardware after finishing operation is complete.
15
16 H. Install hardware items affixed to concrete with machine screws and threaded expansion shields.
17

18 3.3 ADJUSTING AND CLEANING

- 19
20 A. Check and adjust each operating hardware item to ensure proper operating or function of unit.
21
22 B. Lubricate moving parts as recommended by hardware manufacturer. Use graphite type lubrication if
23 none other is recommended.
24
25 C. Repair or replace defective materials or units which cannot be adjusted and lubricated to operate
26 freely and smoothly. Reinstall items found improperly installed.
27
28 D. Prior to Final Acceptance date, readjust and relubricate as necessary.
29

30 3.4 FIELD QUALITY CONTROL

- 31
32 A. Instruct Owner's designated personnel in proper adjustment and maintenance of hardware and
33 finishes at time of final hardware adjustment.
34

35 3.5 MAINTENANCE

- 36
37 A. Continued Maintenance Service: Approximately six months after acceptance of hardware in each
38 area:
39 1. Re-adjust every item of hardware to restore proper function of doors and hardware.
40 2. Consult with and instruct Owner's personnel in recommended additions to maintenance
41 procedures.
42 3. Clean and lubricate operational items wherever installed.
43 4. Replace hardware items which have deteriorated or failed due to faulty design, materials or
44 installation of hardware units.
45

46 3.6 HARDWARE SCHEDULE

- 47
48 A. Provide hardware as scheduled below. All features and products listed in the hardware sets shall be
49 included in bid package. Where security drawings and hardware sets do not match provide hardware
50 as to meet the requirements of the security locations. These discrepancies shall be coordinated prior
51 to submittal.

- 1 B. All Buildings Scheduled:
 2 1. For single doors not assigned a hardware set, provide set C745IR.
 3 2. For pairs of doors not assigned a hardware set, provide set C714A.
 4 C. Remainder of project.
 5 1. The hardware sets below shall be used as the basis of design for proposals for budgeting
 6 purposes. Include similar hardware sets to meet the functions required for each opening.
 7
 8
 9
 10
 11
 12

13 HARDWARE GROUP NO. 101H

14

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050HD 17A L583-363	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER W/ HOLD OPEN	4040XP H OR P4040XP H X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON- RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

15
 16
 17

18 HARDWARE GROUP NO. 103

19

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050HD 17A L583-363	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON- RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

20
 21
 22

23 HARDWARE GROUP NO. 107H

24

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050HD 17A L583-363	626	SCH

1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	OH STOP & HOLDER	100H SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

1
2
3

4 HARDWARE GROUP NO. 201

5

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

6
7
8

9 HARDWARE GROUP NO. 201H

10

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER W/ HOLD OPEN	4040XP H OR P4040XP H X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

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14 HARDWARE GROUP NO. 203

15

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
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4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

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4 HARDWARE GROUP NO. 207

5

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

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9 HARDWARE GROUP NO. 341

10

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/COIN TURN	L9044 17A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

11
12
13

14 HARDWARE GROUP NO. 401

15

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 17A	626	SCH

1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON- RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

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2
3

4 HARDWARE GROUP NO. 401H

5

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 17A	626	SCH
1	EA	SURFACE CLOSER W/ HOLD OPEN	4040XP H OR P4040XP H X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON- RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

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8

9 HARDWARE GROUP NO. 403

10

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 17A	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON- RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

11
12
13

14 HARDWARE GROUP NO. 407H

15

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 17A	626	SCH
1	EA	OH STOP & HOLDER	100H SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE

1 SET SEALS 5050B H & J (USE SILENCERS @ NON-RATED DOORS) BRN NGP
 OMIT @ ALUMINUM FRAMES.

1
2
3

4 HARDWARE GROUP NO. 501

5

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

6
7
8

9 HARDWARE GROUP NO. 501H

10

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER W/ HOLD OPEN	4040XP H OR P4040XP H X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

11
12
13

14 HARDWARE GROUP NO. 501Y

15

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER	4041 OR P4041 DEL X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE

1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

1
2
3

4 HARDWARE GROUP NO. 503S

5

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

6
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9 HARDWARE GROUP NO. 507

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QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

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14 HARDWARE GROUP NO. 811

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QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	SET	LONG DOOR PULL	PR 9266F 36" OVERALL HEIGHT	630	IVE
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

1 SET SEALS 5050B H & J (USE SILENCERS @ NON-RATED DOORS) BRN NGP
 OMIT @ ALUMINUM FRAMES.

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4 HARDWARE GROUP NO. 811C

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QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	SET	LONG DOOR PULL	PR 9266F 36" OVERALL HEIGHT	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON-RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP

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9 HARDWARE GROUP NO. 901

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QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	TRACK & HARDWARE	HAWA JUNIOR 80/B SERIES X 22444 (SOFT CLOSE) PROVIDE WALL ANGLE MOUNT BRACKET		
1	SET	LONG DOOR PULL	PR 9266F 36" OVERALL HEIGHT	630	IVE

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PROVIDE STOP IN TRACK TO KEEP DOOR 4" INTO OPENING WHEN FULLY OPENED.

16 HARDWARE GROUP NO. 902

17

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	SET	TRACK & HARDWARE	9675 SERIES LENGTH AS REQ		
2	EA	FLUSH PULL	227	626	IVE

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21 HARDWARE GROUP NO. C201

22

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE

1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	EU MORTISE LOCK	L9092HDEU 17A RX	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON- RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP
1	EA	CREDENTIAL READER	CARD READER BY ANOTHER SECTION		
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	WHT	SCE
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY ANOTHER SECTION		
1	EA	POWER SUPPLY	PS902 COORDINATE POWER SUPPLY REQUIREMENTS WITH SECURITY.	LGR	VON

1
2 INGRESS BY CARD READER OR KEY OVERRIDE. EGRESS BY LEVER.

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6 HARDWARE GROUP NO. CS201

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QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	EU MORTISE LOCK	L9092HDEU 17A RX	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	CREDENTIAL READER	CARD READER BY ANOTHER SECTION		
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	WHT	SCE
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY ANOTHER SECTION		
1	EA	POWER SUPPLY	PS902 COORDINATE POWER SUPPLY REQUIREMENTS WITH SECURITY.	LGR	VON
		NOTE	REMAINDER OF HARDWARE BY SOUND DOOR MFR		

8
9 INGRESS BY CARD READER OR KEY OVERRIDE. EGRESS BY LEVER.
10 COORDINATE HARDWARE REQUIREMENTS WITH SOUND DOOR PROVIDER. PROVIDE ALL
11 ITEMS REQUIRED FOR COMPLETE SOUND DOOR ASSEMBLY.

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15 HARDWARE GROUP NO. CS201W

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QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 5 X 4.5	652	IVE
1	EA	ELECTRIC HW HINGE	5BB1HW 5 X 4.5 TW8	652	IVE
1	EA	EU MORTISE LOCK	L9092HDEU 17A RX	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	CREDENTIAL READER	CARD READER BY ANOTHER SECTION		
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	WHT	SCE
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY ANOTHER SECTION		
1	EA	POWER SUPPLY	PS902 COORDINATE POWER SUPPLY REQUIREMENTS WITH SECURITY.	LGR	VON
		NOTE	REMAINDER OF HARDWARE BY SOUND DOOR MFR		

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INGRESS BY CARD READER OR KEY OVERRIDE. EGRESS BY LEVER.

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COORDINATE HARDWARE REQUIREMENTS WITH SOUND DOOR PROVIDER. PROVIDE ALL

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ITEMS REQUIRED FOR COMPLETE SOUND DOOR ASSEMBLY.

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9 HARDWARE GROUP NO. E710C

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QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL+-9847A-EO-LBR (WDC @ WD) LENGTH & HEIGHT AS REQ	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL+-9847A-NL-OP-LBR (WDC @ WD) LENGTH & HEIGHT AS REQ	626	VON
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/KEYED CONST. CORE	626	SCH
1	EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
2	EA	LONG DOOR PULL	9266F 36" OVERALL HEIGHT	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B4E	630	IVE
1	SET	SEALS	5050B H & J (USE SILENCERS @ NON- RATED DOORS) OMIT @ ALUMINUM FRAMES.	BRN	NGP
2	EA	ASTRAGAL	9605A LENGTH AS REQUIRED	CL	NGP
2	EA	DOOR CONTACT	679-05 TYPE AS REQ	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-2RS COORDINATE POWER SUPPLY REQUIREMENTS WITH SECURITY.	LGR	VON

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INGRESS BY THE REMOTE RELEASE (LOCATED AT SECURITY) OR KEY OVERRIDE. EGRESS BY

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THE PUSH PADS.

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4 HARDWARE GROUP NO. S002

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QTY	DESCRIPTION NOTE	CATALOG NUMBER REMAINDER OF HARDWARE BY SOUND DOOR MFR	FINISH	MFR
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COORDINATE HARDWARE REQUIREMENTS WITH SOUND DOOR PROVIDER. PROVIDE ALL ITEMS REQUIRED FOR COMPLETE SOUND DOOR ASSEMBLY.

12 HARDWARE GROUP NO. S501

13

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1 EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1 EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	WALL STOP NOTE	WS406/407CCV REMAINDER OF HARDWARE BY SOUND DOOR MFR	630	IVE

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COORDINATE HARDWARE REQUIREMENTS WITH SOUND DOOR PROVIDER. PROVIDE ALL ITEMS REQUIRED FOR COMPLETE SOUND DOOR ASSEMBLY.

20 HARDWARE GROUP NO. S701

21

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	PANIC HARDWARE	98-L LENGTH AS REQ	626	VON
1 EA	SFIC RIM CYLINDER	TYPE AS REQ W/KEYED CONST. CORE	626	SCH
1 EA	PERMANENT CORE	TYPE AS REQUIRED	626	SCH
1 EA	SURFACE CLOSER	4040XP OR P4040XP X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	WALL STOP NOTE	WS406/407CCV REMAINDER OF HARDWARE BY SOUND DOOR MFR	630	IVE

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1 COORDINATE HARDWARE REQUIREMENTS WITH SOUND DOOR PROVIDER. PROVIDE ALL
2 ITEMS REQUIRED FOR COMPLETE SOUND DOOR ASSEMBLY.
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END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glass for interior doors, borrowed lites, and framed storefronts.
2. Glazing sealants and accessories.

1.2 COORDINATION

- ###### A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

- ###### A. Product Data: For each type of product.
- ###### B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- ###### C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- ###### A. Basis-of-Design Glass Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. AGC Glass Company North America, Inc.
 2. Berkowitz, JE, LP.
 3. Cardinal Glass Industries.
 4. Cristacurva Glass.
 5. Guardian Industries Corp.
 6. Oldcastle BuildingEnvelope.
 7. Pilkington North America Inc.
 8. PPG Industries, Inc.
 9. Saint-Gobain Corporation.

10. Schott North America, Inc.
11. Trulite Glass & Aluminum Solutions.
12. Viracon, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Glass installed adjacent to walking surfaces shall withstand the following design loads within limits and under conditions indicated:
 1. Differential deflection of adjacent unsupported edges shall not exceed glass thickness when subjected to 50 lbf/ft. (730 N/m) applied horizontally to one panel at any point up to 42 inches (1067 mm) above the adjacent walking surface.
 2. Base design on thickness at thinnest part of the glass.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Ultraclear Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent.
 1. Products: Subject to compliance with requirements, provide one of the following:

- a. AGC Glass Company North America, Inc.; Krystal Klear.
 - b. Guardian Industries Corp.; UltraWhite.
 - c. Pilkington North America; Optiwhite.
 - d. PPG Industries, Inc.; Starphire.
 - e. Saint-Gobain Corporation; Diamant.
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
- 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.

2.6 GLAZING SEALANTS

- A. General:
- 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As indicated on Drawings or as selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. Pecora Corporation; 890NST.
 - d. Sika Corporation U.S.; Sikasil WS-290.
 - e. Tremco Incorporated; Spectrem 1.

- C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 791.
 - b. GE Advanced Materials - Silicones; SilGlaze II SCS2800.
 - c. Pecora Corporation; 896.
 - d. Sika Corporation U.S.; Sikasil WS-295.
 - e. Tremco Incorporated; Spectrem 2.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Safety Glazing:
 - 1. Install tempered glass in the following locations:
 - a. Doors.
 - b. Operable or fixed lites adjacent to and within the same wall plane as a door whose nearest vertical edge is within 12 inches of the door in closed position and whose bottom edge is less than 60 inches above the floor or walking surface.
 - c. Fixed lites which have a glazed area in excess of 9 sq. ft. and lowest edge is less than 18 inches above finished floor or walking surface within 36 inches of such glazing where panels are not protected with a horizontal member not less than 1-1/2 inches wide located between 24 and 36 inches above the floor or walking surface.
 - d. Other locations as required by Building Code.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- F. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants

cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.6 MONOLITHIC GLASS SCHEDULE

- A. Clear Glass: Clear annealed or fully tempered float glass.
 - 1. Minimum Thickness: As required by performance requirements, but not less than 6 mm.
 - 2. Provide safety glazing as required.
- B. Ultraclear Glass: Ultraclear annealed or fully tempered float glass.
 - 1. Minimum Thickness: As required by performance requirements, but not less than 6 mm.
 - 2. Provide safety glazing as required.

3.7 LAMINATED GLASS SCHEDULE

- A. Clear Laminated Glass: Clear laminated glass with two plies of annealed or fully tempered float glass.
 - 1. Minimum Thickness of Each Glass Ply: As required to meet performance requirements, but not less than 3 mm.
 - 2. Interlayer Thickness: Not less than 0.030 inch.

END OF SECTION

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SECTION 08 83 00

MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. Annealed monolithic glass mirrors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

1.3 CLOSEOUT SUBMITTALS

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

1.4 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Avalon Glass and Mirror Company.
 - 2. Binswanger Glass.
 - 3. Glasswerks LA, Inc.

4. Guardian Industries Corp.
5. Independent Mirror Industries, Inc.
6. National Glass Industries.
7. Trulite Glass & Aluminum Solutions.
8. Virginia Mirror Company, Inc.
9. Walker Glass Co., Ltd.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503.
- B. Annealed Monolithic Glass Mirrors: Mirror Glazing Quality, ultraclear (low-iron) float glass with a minimum 91 percent visible light transmission.
 1. Nominal Thickness: 6.0 mm.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating approved by mirror manufacturer.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors.

2.4 MIRROR HARDWARE

- A. Aluminum J-Channels: As indicated on Drawings.
 1. Bottom and Side 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 0.04 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 0.04 inch.
 3. Finish: Clear bright anodized.
- B. Mirror Bottom Clips: As indicated on Drawings.
- C. Mirror Top Clips: As indicated on Drawings.
- D. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

2.5 FABRICATION

- A. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

- B. Mirror Edge Treatment: Flat polished. Seal edges of mirrors with edge sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. 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. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

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SECTION 09 21 16
GYP SUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings and soffits.
3. Gypsum board.
4. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.3 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install 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 C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. California Expanded Metal Products Company.
 - 2. ClarkDeitrich Building Systems, Inc.
 - 3. Formetal Co. Inc. (The).
 - 4. MarinoWARE.
 - 5. Quail Run Building Materials, Inc.
 - 6. SCAFCO Corporation.
 - 7. Southeastern Stud & Components, Inc.
 - 8. Steel Construction Systems.
 - 9. Steel Network, Inc. (The).
 - 10. Telling Industries, LLC.
 - 11. United Steel Manufacturing.

- B. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.
1. Base-Metal Thickness: 0.018 inch or 0.033 inch.
 2. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Provide one of the following in thickness not less than indicated for studs and in width to accommodate depth of studs:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ClarkDietrich Building Systems; SLP-TRK Slotted Deflection Track.
 - 2) MBA Building Supplies; FlatSteel Deflection Track Slotted or Deflecto Track.
 - 3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
 - 5) Telling Industries; Vertical Slip Track or Vertical Slip Track II.
- D. Firestop Tracks: Manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CEMCO; FAS Track.
 - b. ClarkDietrich Building Systems; BlazeFrame Fire Stop Deflection Track.
 - c. Fire Trak Corp.; Fire Trak System.
 - d. Grace Construction Products; FlameSafe FlowTrak System.
 - e. Metal-Lite, Inc.; The System.
 - f. Steel Network, Inc. (The); VertiTrack VTD.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.053 inch.
- F. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.

1. Depths as follows: 1-1/2 inches.
 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 C 645.
1. Minimum Base-Metal Thickness: 0.018 inch.
 2. Depth: 7/8 inch.
- H. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical or hat shaped.
- I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 3/4 inch.
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
 3. Tie Wire: ASTM A 641/A 641M, 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-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, 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. Anchors: Capable of sustaining a load equal to 5 times that imposed as determined by ASTM E 488.
 - a. Type: Postinstalled, chemical or expansion anchor.
 2. Powder-Actuated Fasteners: Capable of sustaining, a load equal to 10 times that imposed as determined by ASTM E 1190.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Grid Suspension Systems for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. CertainTeed Corp.; Drywall Grid System.
 - c. Chicago Metallic Corporation; Drywall Grid System.
 - d. USG Corporation; Drywall Suspension System.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch-wide flanges.
- 1. Depth: As follows for loads indicated:
 - a. 2 inches deep for 590 lbs. per 1000 ft.
 - b. 1-1/2 inches deep for 475 lbs per 1000 ft.
 - c. 3/4 inches deep for 300 lbs per 1000 ft.
- F. Furring Channels (Furring Members):
- 1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 - 2. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.
 - a. Minimum Base-Metal Thickness: 0.033 inch.
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.018 inch.
 - 4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.

2.4 GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.
 - 4. National Gypsum Company.
 - 5. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
- 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- C. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch.
 2. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: 5/8 inch, Type X.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
 - c. National Gypsum Company; Gold Bond eXP Tile Backer.
 2. Core: 5/8 inch, Type X.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Wonderboard.
 - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - c. National Gypsum Company, Permabase Cement Board.
 - d. USG Corporation; DUROCK Cement Board.
 2. Thickness: 5/8 inch.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, 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. Aluminum Trim and Reveals: Extruded accessories of profiles and dimensions indicated.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 - 3. Finish and Profile: As indicated on Drawings.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- 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, 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.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, lightweight all-purpose compound.
- D. Joint Compound for Tile Backing Panels:
- 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- C. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- D. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- E. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- F. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- G. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 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.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. 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 runner 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-Furring Members:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. 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.
3. 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.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- 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, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 3. Do not attach hangers to steel roof deck.
 4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. 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.

3.4 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch 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. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.5 APPLYING GYPSUM BOARD

- A. Install gypsum board in the following locations:
1. Type X: All surfaces unless indicated otherwise indicated.
 2. Flexible Type: Apply in double layer at curved assemblies.
 3. Moisture-and-Mold-Resistant Type: Interior surfaces of exterior wall framing, unless wall is indicated to receive tile.
 4. Tile Backing Panels: All surfaces indicated to receive tile.
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. 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 or fasten face layers with adhesive and supplementary fasteners according to fire-resistive requirements of assembly.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board),

comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.6 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at showers, tubs, and other locations indicated to receive tile where tile weight does not exceed 5 lbs./sq. ft.. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and other locations indicated to receive tile or stone exceeding 5 lbs./sq. ft.
- C. Where tile backing panels abut other types of panels in same plane, shim framing surfaces to produce a uniform plane across panel surfaces.

3.7 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings. If not indicated on Drawings, install according to ASTM C 840 in and in the following locations:
 1. Partitions:
 - a. at 30'-0" on center and no further than 10'-0" from corners of walls.
 - b. at both corners of openings in wall planes, both above and/or below opening, where width of opening is 6'-0" or greater, or where ratio of width to height of wall plane above and/or below opening exceeds 4:1.
 - c. at specific locations approved by Architect for visual effect.
 2. Ceilings: Install control joints at 30'-0" on center each direction and where wings of "A", "O", "U", and "T" shaped ceiling areas or furr-down areas are joined, or as indicated on Drawings.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners unless otherwise indicated.
 2. Bullnose Bead: Use only where indicated.

3. J-Bead: Use where gypsum board construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate
 4. LC- or U-Bead: Use at exposed panel edges not covered with joint compound.
 5. L-Bead: Use where edge trim can only be installed after gypsum board is installed.
 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim and Reveals: Install in locations indicated on Drawings.

3.8 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, beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 0: Provide in areas for temporary construction or whenever the final decoration has not been determined or in other areas not normally open to view. Do not use in areas where fire and smoke code are required.
 2. Level 1: Provide in plenum areas above ceilings, in attics, in areas where the assembly would generally be concealed, or in building service corridors and other areas not normally open to view.
 3. Level 2: Provide where tile backing panels are used as a substrate for tile or stone.
 4. Level 3: Provide in areas scheduled to receive heavyweight wall coverings.
 5. Level 4: Provide in typical areas that are to receive flat, satin or semi-gloss paint.
 6. Level 5: Provide in areas that are to receive gloss or semi-gloss paint in areas flooded with artificial or natural lighting exceeding 60 fc and all areas scheduled to receive medium or lightweight wall coverings
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.9 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

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SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic mosaic tile.
2. Unglazed porcelain floor or wall tile.
3. Glazed or unglazed wall tile.
4. Waterproof membrane.
5. Crack isolation membrane.
6. Metal edge strips.

1.2 DEFINITIONS

- A. High-Performance Tile Grout: A factory-prepared grouting material mixture of cement and other ingredients, including a redispersible latex/polymer powder, to which only water is added at the jobsite, or a liquid latex additive.
- B. Improved Modified Dry-Set Mortar (Thinset): Modified Dry-Set Mortar with a minimum bond strength of 300 psi to impervious ceramic tile.
- C. Large and Heavy Tile (LHT): Any tile material weighing 5 lbs./sq. ft. or greater, or any tile with a least horizontal dimension of 15 inches or more.
- D. Modified Dry-Set Mortar for Large and Heavy Tile (LHT): Formerly "Medium Bed Mortar," is a modified dry-set mortar formulated to have a bond coat thickness between 3/32 and 1/2 inch after tile embedment, and declared as an "LHT" setting material by the manufacturer based on these characteristics.
- E. Modified Dry-Set Mortar (Thinset): A factory-prepared setting material mixture of cement and other ingredients, including a redispersible latex/polymer powder, to which only water is added at the jobsite, or a liquid latex additive.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples:
 1. Each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide samples of each color blend.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of floor tile installation.
 - 2. Build mockup of each type of wall tile installation.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics 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.

2.2 TILE PRODUCTS

- A. Factory-Mounted Ceramic Mosaic Tile:
 - 1. Products: Subject to compliance with requirements, provide product indicated on Drawings.
 - 2. Composition: Impervious natural clay or porcelain.
 - 3. Module Size: As indicated by product designations on Drawings.
 - 4. Thickness: 1/4 inch.
 - 5. Face: As indicated by product designations on Drawings.
 - 6. Dynamic Coefficient of Friction: For products on floor surfaces, not less than 0.42.
 - 7. Finish: As indicated by product designations on Drawings.
 - 8. Tile Color and Pattern: As indicated on Drawings.
 - 9. Grout Color: As indicated on Drawings.
 - 10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide the following coordinating shapes where indicated on Drawings:
 - a. Base: Coves.
 - b. Base Caps: Surface bullnose.
 - c. Wainscot Caps: Surface bullnose.
 - d. External Corners: Bullnose.
 - e. Internal Corners: Coves.
- B. Unglazed Porcelain Floor or Wall Tile:

1. Products: Subject to compliance with requirements, provide product indicated on Drawings.
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face: As indicated by product designations on Drawings.
4. Face Size Variation: Rectified.
5. Thickness: As indicated by product designations on Drawings, but not less than 3/8 inch.
6. Face: As indicated by product designations on Drawings.
1. Dynamic Coefficient of Friction: For products on floor surfaces, not less than 0.42.
2. Tile Color and Pattern: As indicated on Drawings.
3. Grout Color: As indicated on Drawings.
1. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide the following coordinating shapes where indicated on Drawings:
 - a. Base Cap: Surface bullnose, module as indicated on Drawings.
 - b. Wainscot Cap: Surface bullnose, module size as indicated on Drawings.
 - c. External Corners: Surface bullnose, module size as indicated on Drawings.

C. Glazed or Unglazed Wall Tile:

1. Products: Subject to compliance with requirements, provide product indicated on Drawings.
2. Module Size: As indicated by product designations on Drawings.
3. Face Size Variation: Rectified.
4. Thickness: 5/16 inch.
5. Face: As indicated by product designations on Drawings.
6. Finish: As indicated by product designations on Drawings.
7. Tile Color and Pattern: As indicated on Drawings.
8. Grout Color: As indicated on Drawings.
1. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide the following coordinating shapes where indicated on Drawings:
 - a. Base: Coved or straight as indicated.
 - b. Wainscot Cap: Bullnose cap.
 - c. External Corners: Bullnose, same size as adjoining flat tile.
 - d. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.3 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Floor Surfaces:

1. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Bostik, Inc; Hydroment Blacktop 90210.
 - 2) Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - 3) Laticrete International, Inc; Laticrete 9235 Waterproof Membrane.
 - 4) MAPEI Corporation; Mapelastic™ 400 or Mapelastic™ HPG

C. Wall Surfaces:

1. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Bostik, Inc; Bostik GoldPlus or Durabond D-222 Duraguard Membrane.
 - 2) Custom Building Products; Custom 9240 or RedGard Waterproofing and Crack Prevention Membrane.
 - 3) Laticrete International, Inc; Laticrete Hydro Ban or Laticrete Hydro Barrier.
 - 4) MAPEI Corporation; Mapelastic HPG or Mapelastic™ AquaDefense.

2.4 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, 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. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Noble Company (The); Nobleseal CIS.
- C. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Crack Buster Pro-Crack Prevention Mat Underlayment.
 - b. MAPEI Corporation; Mapeguard™ 2or Mapesonic 2.

- D. Fabric-Reinforced, Fluid-Applied Membrane: 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. Bostik, Inc; Hydroment Blacktop 90210.
 - b. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - c. Laticrete International, Inc; Laticrete Blue 92 Anti-Fracture Membrane.
 - d. MAPEI Corporation; Mapelastc HPG with MAPEI Fiberglass Mesh.

2.5 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
- B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; H.B. Fuller Construction Products Inc.
- C. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; H.B. Fuller Construction Products Inc.
 - 2. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
 - 3. For wall applications, provide nonsagging mortar.
- D. Modified Dry-Set Mortar for Large and Heavy Tile (LHT): Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 5/8 inch.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; H.B. Fuller Construction Products Inc.
- 2. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
 - 3. For wall applications, provide nonsagging mortar.
- E. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; H.B. Fuller Construction Products Inc.
 - 2. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
 - 3. For wall applications, provide nonsagging mortar.

2.6 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; H.B. Fuller Construction Products Inc.
 - 2. Where joints size is 1/8 inch or less, use unsanded grout. Where joints are greater than 1/8 inch, use sanded grout.
- C. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; H.B. Fuller Construction Products Inc.
 2. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
 3. Where joints size is 1/8 inch or less, use unsanded grout. Where joints are greater than 1/8 inch, use sanded grout.
- D. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; H.B. Fuller Construction Products Inc.

2.7 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 and Trim Strips: Angle or L-shape, height to match tile and setting-bed thickness, designed specifically for application indicated; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
 1. Products: Subject to compliance with requirements, provide products indicated on Drawings.
- C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal American, an Oldcastle company.
 - b. Custom Building Products.
 - c. Summitville Tiles, Inc.
 - d. TEC; H.B. Fuller Construction Products Inc.

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 bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 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 or indicated 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.
- G. Joint Widths: Install tile with joint widths recommended by the manufacturer for products indicated.
- 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 but not greater than 30 feet on center
 1. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 2. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 3. Install control and expansion joints in accordance with TCNA Handbook Method No. EJ171.
- J. Metal Edge Strips: Install at locations indicated. If not indicated, install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as floor has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- L. Install tile backing 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.

- M. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- N. 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.

3.4 THICKSET INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Floor Installations, Concrete Subfloor:
 - 1. Commercial Kitchen Floors: TCNA F114 and ANSI A108.1B; cement mortar bed (thickset) with cleavage membrane; epoxy grout.
 - a. Bond Coat for Cured-Bed Method: Improved modified dry-set mortar.
 - b. Grout: Water-cleanable epoxy grout.
- B. Shower Receptor Installations:
 - 1. Ceramic Tile Installation: TCNA B414 and ANSI A108.1B; cement mortar bed (thickset) on waterproof membrane bonded to concrete.
 - a. Bond Coat for Cured-Bed Method: Modified dry-set mortar.
 - b. Grout: High-performance grout.

3.5 THINSET INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Floor Installations, Concrete Subfloor:
 - 1. Slabs-On-Grade: Unless otherwise indicated, TCNA F113; thinset mortar.
 - a. Thinset Mortar: Modified dry-set mortar. Use modified dry-set mortar approved for LHT applications for large and heavy tile.
 - b. Grout: High-performance grout.
 - 2. Restroom and Servery Floors on Slabs-On-Grade: TCNA F113; thinset mortar.
 - a. Thinset Mortar: Modified dry-set mortar. Use modified dry-set mortar approved for LHT applications for large and heavy tile.
 - b. Grout: Water-cleanable epoxy grout.
 - 3. Elevated Slabs: Unless otherwise indicated, TCNA F125-Full; thinset mortar on crack isolation membrane.
 - a. Thinset Mortar: Modified dry-set mortar. Use modified dry-set mortar approved for LHT applications for large and heavy tile.
 - b. Grout: High-performance grout.

4. Restroom and Servery Area Floors on Elevated Slabs: TCNA F125-Full; thinset mortar on crack isolation membrane.
 - a. Thinset Mortar: Modified dry-set mortar. Use modified dry-set mortar approved for LHT applications for large and heavy tile.
 - b. Grout: Water-cleanable epoxy grout.

B. Wall Installations:

1. Dry Locations: Unless otherwise indicated, TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.
 - a. Thinset Mortar: Modified dry-set mortar. Use modified dry-set mortar approved for LHT applications for large and heavy tile.
 - b. Grout: High-performance grout.

C. Shower Wall Installations:

1. Wet Locations: TCNA B415; thinset mortar on waterproof membrane over cementitious backer units or fiber-cement backer board.
 - a. Thinset Mortar: Modified dry-set mortar. Use modified dry-set mortar approved for LHT applications for large and heavy tile.
 - b. Grout: High-performance grout.

END OF SECTION

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SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: 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.

1.3 CLOSEOUT SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical ceiling area as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages 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.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

2.3 ACOUSTICAL PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion or bonded anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 2. 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 hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
- 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 A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.5 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
- B. Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished flanges.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
- 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 and the following:
 - 1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
 - 2. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
 - 3. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
 - 2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
 - 3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- 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 either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. 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. Fasten hangers to postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 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 and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. 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 a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 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. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 4. 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.
 5. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 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. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 09 61 05

MOISTURE VAPOR EMISSION CONTROL FOR CONCRETE SLABS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Topical water vapor reduction system and cementitious surfacing on concrete slabs to receive tile carpet, resilient flooring, or other moisture sensitive flooring.

B. Related Requirements:

1. Pre-installation testing methods and quantities for each unique flooring product are specified within each individual flooring product Section in Division 09.

1.2 UNIT PRICES

A. Work of this Section is affected by the following unit prices specified in Section 01 22 00 "Unit Prices":

1. Unit Price No. #2: Topical moisture vapor emission and alkalinity control of concrete floor slabs and cementitious surfacing installation in tile carpeted areas, wood flooring product areas, and resilient flooring product areas.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to installation including, but not limited to, the following:

1. Review substrate conditions, moisture and pH test results, manufacturer's installation instructions, and warranty requirements.
2. Document proceedings, including required corrective measures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product used in vapor emission control system.

1.5 INFORMATIONAL SUBMITTALS

A. Product Schedule: For all floor areas to receive moisture vapor emission and alkalinity control system products. Use same room label and numbering designations indicated on Drawings.

- B. Qualification Data: Certificates indicating Installer of vapor emission control treatments is trained and certified or employed by treatment manufacturer.
- C. Product Test Reports: For each product performed by nationally recognized independent testing agency indicating conformance with specified performance requirements.
- D. Preconstruction Test Reports: For alkalinity, calcium chloride, and relative humidity of concrete slabs.
- E. Sample Warranty: For manufacturer's warranty for vapor emission control coating system and certificate of underwriter's coverage of manufacturer's warranty.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum five (5) years experience in manufacturing water vapor reduction systems.
 - 1. The water vapor emission reduction system must be specifically formulated and marketed for water vapor emission reduction and alkalinity control without change of system design for a minimum period of ten (10) years.
- B. Installer Qualifications: Manufacturer of products or an entity that employs installers and supervisors who are trained and certified by manufacturer. Installer must have a minimum of five years experience installing vapor emissions control systems.
- C. Testing Agency Qualifications: Moisture and pH testing shall be performed by an International Concrete Repair Institute (ICRI), Certified Concrete Slab Moisture Testing Technician – Grade 1.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Following at least 28 days after placement of concrete and prior to floor covering installation, engage a qualified independent testing agency to perform the following tests on floor areas to receive moisture vapor emission and alkalinity control system:
 - 1. Calcium chloride testing per ASTM F 1869.
 - 2. Relative humidity testing per ASTM F 2170.
 - 3. Alkalinity testing per ASTM F 710.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's unopened containers fully identified with brand, type, grade, class and all other qualifying information.
- B. Deliver materials in accordance with manufacturer's written instructions and recommendations.

- C. Store materials in a dry, well-ventilated area at minimum 50 deg F and maximum 90 deg F.

1.9 COORDINATION AND SEQUENCING

- A. Coordinate testing agency to test concrete slabs not less than one week or more than 5 weeks prior to scheduled flooring installation.
 - 1. Apply treatment to areas with moisture vapor emission or relative humidity rates which exceed floor covering manufacturer's written limits, as determined by ASTM F 1869 and ASTM F 2170 testing.
- B. Coordinate with installation of floor coverings. Ensure flooring installation complies with vapor emission control system manufacturer's warranty requirements.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of treatment system, cementitious surfacings, floor covering materials, adhesives, and installation labor for same period resulting from moisture vapor emission related failure that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Warranty shall be underwritten by product liability insurance carrier having a minimum "A" rating from Best or equivalent rating system in the amount of \$1,000,000 per occurrence.
- C. Warranty shall guarantee moisture vapor and alkalinity emission rates to be at or below published requirements of floor covering manufacturers.
- D. Warranty shall not exclude concrete slabs containing silica or silicate compounds.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products manufactured by one of the following:
 - 1. Ardex Engineered Cements, Inc.
 - 2. BASF Corporation
 - 3. Floor Seal Technology, Inc.
 - 4. Koster Waterproofing Systems USA.

2.2 SYSTEM DESCRIPTION

- A. Multi- or single-component, fluid-applied penetrants or coatings intended to seal or stabilize internal humidity by restricting excessive moisture and pH (alkalinity), and to mechanically regulate permeability and suppress the volume of moisture reaching concrete surfaces, for compliance with subsequent floor covering manufacturer's written limitations.
 - 1. Application methods are to be determined by site conditions, presence of sub-slab vapor barriers for slabs-on-grade, concrete mix design and contaminants, age of concrete substrate, results of ASTM F1869 calcium chloride testing, if required, and finish floor covering manufacturer's recommendations.

2.3 MOISTURE VAPOR EMISSION AND ALKALINITY CONTROL SYSTEMS

- A. Products: Subject to compliance with requirements, provide one of the following:

- 1. Ardex Engineered Cements, Inc.; MC ULTRA Moisture Control System.
- 2. BASF Corporation; Chemrex MV-Block.
- 3. Floor Seal Technology, Inc.; MES 100 Remedial Treatment.
- 4. Koster Waterproofing Systems USA; Koster VAP I 2000 FS.

- B. Physical Characteristics:

- 1. ASTM E 96 Water Vapor Transmission: Minimum 94% reduction under laboratory conditions
- 2. ASTM D 1308 Alkali Resistance: PASS, up to pH of 14
- 3. ASTM D 4541 Adhesion Strength: 500 psi (100% Concrete Adhesive Failure)
- 4. Resists up to 100% Relative Humidity as measured by ASTM F 2170.
- 5. VOC: 96g/L per SCAQMD Rule #1113

2.4 ACCESSORIES

- A. Cementitious Surfacing: Portland cement-based, self-leveling compound to be applied to areas receiving resilient or wood flooring. Cement must bond with subsequent floor coverings and adhesives.

- 1. Available Products: Subject to compliance with requirements, available products include, but are not limited to the following:
 - a. Ardex K-15 by Ardex Engineered Cements, Inc.; Ardex K-15.
 - b. Koster Waterproofing Systems USA; Koster SL.
 - c. Mapei International; Mapei Ultraplan 1 Plus.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with conditions affecting performance of the Work.

- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Mask and protect adjacent wall and floor surfaces from effects of scarification and application.
- B. Scarify slab surface in area of application by shot blasting or other method acceptable to coating treatment manufacturer.
- C. Prepare and treat cracks, control joints, and cold joints per system manufacturer's written requirements.
- D. Sweep and vacuum concrete substrate.

3.3 INSTALLATION

- A. Apply treatment system in number of coats required by manufacturer with roller and squeegee over entire treatment area; saturate surfaces to ensure a thorough bond.
- B. Clean and fill divots, chips, voids and other surface irregularities with 100 percent Portland cement based patching compound or cementitious fill.
- C. Apply cementitious surfacing over coating in areas to receive tile carpet, wood, resilient flooring, or other moisture sensitive flooring to facilitate adhesive bond.
 - 1. Apply at a minimum thickness of 1/8-inch.

3.4 PROTECTION

- A. Protect each coat during specified cure period from traffic, topical water, and contaminants.

END OF SECTION

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SECTION 09 65 13.13

RUBBER BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. 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.

PART 2 - PRODUCTS

2.1 RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AB; American Biltrite.
 - 2. Allstate Rubber Corp.
 - 3. Armstrong World Industries, Inc.
 - 4. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 - 5. Flexco.
 - 6. Johnsonite; A Tarkett Company.
 - 7. Mondo Rubber International, Inc.
 - 8. Nora Systems, Inc.
 - 9. Roppe Corporation, USA.
 - 10. VPI, LLC, Floor Products Division.
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
 - 1. Group: I (solid, homogeneous).
 - 2. Style and Location:
 - a. Style A, Straight: Provide in areas indicated.
 - b. Style B, Cove: Provide in areas indicated.
 - c. Style C, Butt to: Provide in areas indicated.

d. Style D, Sculptured: Provide in areas indicated.

1) Profile: As indicated.

- C. Thickness: 0.125 inch.
- D. Height: As indicated on Drawings.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Job formed.
- H. Colors: As indicated on Drawings.

2.2 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Roppe Corporation, USA.
 - 2. VPI, LLC, Floor Products Division.
- B. Profile and Dimensions: As indicated on Drawings.
- C. Locations: Provide rubber molding accessories in areas indicated.
- D. Colors and Patterns: As indicated on Drawings.

2.3 INSTALLATION MATERIALS

- A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 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 they are the same temperature as the space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RUBBER 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. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 4 inches in length.
 - a. Miter or cope corners to minimize open joints.

3.3 RUBBER ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. 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.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modular carpet tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For carpet tile installation, plans showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each exposed product and for each color and texture required.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.6 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Products: Subject to compliance with requirements, provide products indicated on Drawings.
- B. Color: As indicated on Drawings.
- C. Pattern: As indicated on Drawings.
- D. Primary Backing/Backcoating: Manufacturer's standard composite materials.
- E. Secondary Backing: Manufacturer's standard material.
- F. Module Size: As indicated on Drawings.
- G. 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.
- H. Performance Characteristics:
 - 1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
 - 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - 3. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646.
 - 4. Tuft Bind: Not less than 6.2 lbf according to ASTM D 1335.
 - 5. Delamination: Not less than 3.5 lbf/in. according to ASTM D 3936.
 - 6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
 - 7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
 - 8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.

9. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
 1. Adhesives shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Concrete Slabs:
 1. 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 F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.
- H. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 09 72 16
VINYL WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl wall covering.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 286.

2.2 VINYL WALL COVERING

- A. Products: Subject to compliance with requirements, provide products indicated on Drawings.
- B. Description: Provide mildew-resistant products in rolls from same production run and complying with the following:
 - 1. FS CCC-W-408D or CFFA-W-101-D for Type II, Medium-Duty or better products.
 - 2. ASTM F 793 for strippable wall coverings.
 - a. Category: V, Type II, Commercial Serviceability.
- C. Total Weight: As standard with manufacturer.
- D. Width: 27 inches 54 inches, as standard with manufacturer.
- E. Backing: Osnaburg or nonwoven fabric.
- F. Colors, Textures, and Patterns: As indicated on Drawings.

2.3 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
 - 1. Adhesive shall have a VOC content of 50 g/L or less.
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 09 91 23 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- 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. Metals: If not factory primed, clean and apply primer recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.

3. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 4. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
 - E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
 - F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.2 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Match pattern 72 inches above the finish floor.
- F. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- I. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- J. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

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SECTION 09 81 16
ACOUSTIC BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Acoustic glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

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.

PART 2 - PRODUCTS

2.1 ACOUSTIC GLASS-FIBER BLANKET INSULATION

- A. Acoustic Glass-Fiber Blanket with Abuse-Resistant Composite Facing: ASTM C 553, Type I & II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less).
1. Products: Subject to compliance with the requirements, provide the following:
 - a. CertainTeed; CertaPro™ AcoustaBlanket™ Black, Type 150.
 2. Density: 1.5 lbs./cu. ft.
 3. Thickness: 2 inches.
 4. Size: 48 inches wide by 50 feet roll length.
 5. R-Value: R = 8.3.

6. Color: Black.
7. Acoustical Performance:
 - a. Absorption Coefficients:
 - 1) 125 Hz: Not less than 0.34.
 - 2) 500 Hz: Not less than 0.96.
 - 3) 2000 Hz: Not less than 1.00
 - b. Noise Reduction Coefficient (NRC): Not less than 0.90.

2.2 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

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

- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths.

3.3 INSTALLATION OF ACOUSTIC GLASS-FIBER BLANKET INSULATION

- A. Anchor Installation: Install acoustic glass-fiber blanket insulation on solid substrates by adhesively attached, spindle-type insulation anchors as follows:
 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 2. After adhesive has dried, install acoustic glass-fiber blanket insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.4 PROTECTION

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

END OF SECTION

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SECTION 09 81 16
ACOUSTIC BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Acoustic glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

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.

PART 2 - PRODUCTS

2.1 ACOUSTIC GLASS-FIBER BLANKET INSULATION

- A. Acoustic Glass-Fiber Blanket with Abuse-Resistant Composite Facing: ASTM C 553, Type I & II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less).
1. Products: Subject to compliance with the requirements, provide the following:
 - a. CertainTeed; CertaPro™ AcoustaBlanket™ Black, Type 150.
 2. Density: 1.5 lbs./cu. ft.
 3. Thickness: 2 inches.
 4. Size: 48 inches wide by 50 feet roll length.
 5. R-Value: R = 8.3.

6. Color: Black.
7. Acoustical Performance:
 - a. Absorption Coefficients:
 - 1) 125 Hz: Not less than 0.34.
 - 2) 500 Hz: Not less than 0.96.
 - 3) 2000 Hz: Not less than 1.00
 - b. Noise Reduction Coefficient (NRC): Not less than 0.90.

2.2 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

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

- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths.

3.3 INSTALLATION OF ACOUSTIC GLASS-FIBER BLANKET INSULATION

- A. Anchor Installation: Install acoustic glass-fiber blanket insulation on solid substrates by adhesively attached, spindle-type insulation anchors as follows:
 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 2. After adhesive has dried, install acoustic glass-fiber blanket insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.4 PROTECTION

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

END OF SECTION

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SECTION 09 84 33
SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes shop-fabricated, acoustical metal panel units tested for acoustical performance, including the following:
 - 1. Sound-absorbing metal wall panels.

1.2 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include metal panel facing, panel edge, core material, and mounting indicated.
- B. Shop Drawings: For unit assembly and installation.
 - 1. Include plans, elevations, sections, and mounting devices and details.
 - 2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
 - 3. Include details at cutouts and penetrations for other work.
- C. Samples for Initial Selection:
 - 1. Include Samples of metal panels for corrugated profile selection.
- D. Samples for Verification: For the following products:
 - 1. Metal Panel Facings: Full-width by approximately 36-inch-long Sample showing each color finish.
 - 2. Panel Edge: 12-inch-long Sample(s) showing each edge profile, corner, and color finish.
 - 3. Core Material: 12-inch-square Sample at corner.
 - 4. Mounting Devices: Full-size Samples.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Electrical outlets, switches, and thermostats.
 - 2. Items penetrating or covered by units including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of unit to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and units in unopened packaging and store in a temperature-controlled dry place with adequate air circulation.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and 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. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- C. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain all metal wall panel units, perimeter trim, corner angles, z-furring units, and acoustical cores specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

2.3 SOUND-ABSORBING WALL UNITS

- A. Sound-Absorbing Metal Wall Panel Units: Manufacturer's standard panel construction consisting of metal panel facing and edging material wrapped around a sound absorbing layer of glass-fiber insulation.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. ALPRO Acoustical Systems; Division of Gordon, Inc.
 2. Wall Panel Facing Material: Perforated aluminum sheet
 - a. Panel Profile: Corrugated.
 - 1) Pattern: As selected from manufacturer's standard options.
 3. Mounting: Back mounted with manufacturer's standard z-furring, secured to substrate.
 4. Core: Glass-fiber insulation.
 5. Edge Construction: Manufacturer's standard extruded or brake-formed aluminum J-trim and inside/outside corner angles in size and length required to completely support and finish trim the metal wall panels as shown in elevations.
 - a. All mounting accessories shall be finished to match wall panel facing material.
 6. Corner Detail in Elevation: Square with continuous edge profile indicated.
 7. Facing Material: Perforated aluminum metal panel.
 8. Acoustical Performance: Sound absorption NRC of 0.90 to 1.00 according to ASTM C 423 for Type A mounting according to ASTM E 795.
 9. Nominal Core Thickness: 2 inches.
 10. Panel Width: As indicated on Drawings.
 11. Panel Height: As indicated on Drawings.

2.4 MATERIALS

- A. Perforated Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy 3003-H14, with temper as required to suit forming operations and structural performance required.
 - 1. Thickness: Not less than 0.032 inch.
 - 2. Perforation Pattern: 1/8 inch diameter holes on 21/64 inch staggered centers.
 - a. Open Area: 13 percent.
 - 3. Surface: Smooth, flat finish.
 - 4. Finish: Powder coated.
 - a. Color: Dark Bronze; PDR-20205.
- B. Aluminum Extrusions: ASTM B 221
- C. Core Materials:
 - 1. Glass-Fiber Insulation: ASTM C 612; of type standard with manufacturer; nominal density of 1.5 to 2 lb/cu. ft., wrapped in black polyethylene sheet with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- D. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:
 - 1. Z-Furring: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

2.5 FINISHES

- A. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.6 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine metal finishes, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.
- C. Align metal panel corrugations with adjacent units.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.
- B. Variation of Joint Width: Not more than 1/32-inch variation from hairline in 48 inches, noncumulative.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION

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SECTION 09 84 36

FELT WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes shop-fabricated, felt wall panel units tested for acoustical performance.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For unit assembly and installation.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 FELT WALL UNITS

- A. Felt Wall Panel Planks: Manufacturer's standard panel construction consisting of wool facing material laminated to edges of a 3/4 inch plywood core stretched over front face of PET acoustical material and mechanically fastened to a 3/4 inch thick MDF backer board.
- B. Products: Subject to compliance with requirements, provide the following:
 - 1. FilzFelt; ARO Plank 5.
 - a. Core-Face Layer: Manufacturer's standard acoustic PET material.
 - b. Core-Base Layer: Manufacturer's standard plywood core.
 - 2. Edge Profile: Top edges and ends chamfered, bottom edges square.
 - 3. Corner Detail in Elevation: Square with continuous edge profile indicated.
 - 4. Reveals between Panels: V-shaped reveals.
 - 5. Facing Material: 100 percent wool.
 - a. Thickness: 3 mm.

6. Planks Sizes and Arrangement: As indicated on Drawings from the following options:
 - a. 236 cm by 9 cm by 3.2 cm.
 - b. 157 cm by 5 cm by 3.2 cm.
 - c. 157 cm by 5 cm by 1.9 cm.
 - d. 79 cm by 5 cm by 3.2 cm.
 - e. 79 cm by 5 cm by 1.9 cm.
7. Repeat Width: 7100 cm.
8. Repeat Height: 9200 cm.
9. Acoustical Performance: Sound absorption NRC of not less than 0.65 according to ASTM C 423 for mounting according to ASTM E 795.
10. Nominal Overall Panel Thickness: 2 inches.

2.2 MATERIALS

- A. Core Materials: Manufacturer's standard.
- B. Facing Material: Fabric from same dye lot; color and as indicated on Drawings.
- C. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of units.

2.3 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.
- C. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
- D. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.2 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel.
 - 4. Galvanized metal.
 - 5. Aluminum (not anodized or otherwise coated).
 - 6. Wood.
 - 7. Gypsum board.
 - 8. Cotton or canvas insulation covering.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

- 2. Indicate VOC content.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 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 specified in Part 3.
 - 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.

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 less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. Coronado Paint; Benjamin Moore Company.
3. Frazee Paint; Comex Group.
4. Glidden Professional.
5. Kelly-Moore Paint Company Inc.
6. Kwal Paint; Comex Group.
7. Parker Paint; Comex Group.
8. PPG Architectural Finishes, Inc.
9. Pratt & Lambert.
10. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Floor Coatings: 100 g/L.
 9. Shellacs, Clear: 730 g/L.
 10. Shellacs, Pigmented: 550 g/L.
- D. Colors: As indicated in a color schedule on Drawings.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.

2.4 PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior: MPI #50.
- B. Primer, Alkali Resistant, Water Based: MPI #3.
- C. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.
- D. Primer, Latex, for Interior Wood: MPI #39.
- E. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107.
- B. Primer, Galvanized, Water Based: MPI #134.
- C. Primer, Quick Dry, for Aluminum: MPI #95.

2.6 WATER-BASED PAINTS

- A. Latex, Interior, Flat, (Gloss Level 1): MPI #53.
- B. Latex, Interior, (Gloss Level 3): MPI #52.
- C. Latex, Interior, (Gloss Level 4): MPI #43.
- D. Latex, Interior, Semi-Gloss, (Gloss Level 5): MPI #54.
- E. Latex, Interior, Gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees): MPI #114.
- F. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1): MPI #143.
- G. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 3): MPI #145.
- H. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5): MPI #147.
- I. Latex, Interior, High Performance Architectural, (Gloss Level 4): MPI #140.
- J. Latex, Interior, High Performance Architectural, Semi-Gloss (Gloss Level 5): MPI #141.
- K. Light Industrial Coating, Interior, Water Based (Gloss Level 3): MPI #151.
- L. Light Industrial Coating, Interior, Water Based, Semi-Gloss (Gloss Level 5): MPI #153.

2.7 TEXTURED COATING

- A. Textured Coating, Latex, Flat: MPI #42.

2.8 DRY FOG/FALL COATINGS

- A. Dry Fall, Latex, Flat: MPI #118.
- B. Dry Fall, Water Based, for Galvanized Steel, Flat (Gloss Level 1): MPI #133.

2.9 FLOOR COATINGS

- A. Stain, Interior, for Concrete Floors: MPI #58.
- B. Floor Paint, Latex, Low Gloss (Maximum Gloss Level 3): MPI #60.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of

size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in 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.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces – MPI INT 3.1A:
1. Latex System – Eggshell Finish:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.
 2. Latex System – Semi-Gloss Finish:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
- B. Concrete Substrates, Traffic Surfaces – MPI INT 3.2A:
1. Latex Floor Enamel System:

- a. Prime Coat: Floor paint, latex, low gloss (maximum Gloss Level 3), MPI #60.
 - b. Intermediate Coat: Floor paint, latex, low gloss (maximum Gloss Level 3), MPI #60.
 - c. Topcoat: Floor paint, latex, low gloss (maximum Gloss Level 3), MPI #60.
- 2. Concrete Stain System:
 - a. First Coat: Stain, interior, for concrete floors, MPI #58.
 - b. Topcoat: Stain, interior, for concrete floors, MPI #58.
- C. Concrete Substrates, Deck or Ceiling Above – MPI INT 3.1N
 - 1. Latex Aggregate System – Flat Finish:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Textured coating, latex, flat, MPI #42.
- D. CMU Substrates – MPI INT 4.2A:
 - 1. Latex System – Eggshell Finish:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.
 - 2. Latex System – Semi-Gloss Finish:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
- E. Steel Substrates, Hollow Metal Doors & Frames – MPI INT 5.1B:
 - 1. Water-Based Light Industrial Coating System – Eggshell Finish:
 - a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
 - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based (Gloss Level 3), MPI #151.
 - 2. Water-Based Light Industrial Coating System – Semi-Gloss Finish:
 - a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
 - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based, semi-gloss (Gloss Level 5), MPI #153.
- F. Steel Substrates, Metal Deck Above – MPI INT 5.1C:

1. Water-Based Dry-Fall System:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Topcoat for Shop Primed or Previously Painted Steel: Dry fall, latex, flat, MPI #118.

- G. Steel Substrates, Other – MPI INT 5.1R:
 1. High-Performance Architectural Latex System – Semi-Gloss:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 4), MPI #140.
 2. High-Performance Architectural Latex System – Gloss:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.

- H. Galvanized-Metal Substrates, Hollow Metal Doors & Frames – MPI INT 5.3K:
 1. Water-Based Light Industrial Coating Over Waterborne Primer System – Eggshell Finish:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based (Gloss Level 3), MPI #151.
 2. Water-Based Light Industrial Coating Over Waterborne Primer System – Semi-Gloss Finish:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based, semi-gloss (Gloss Level 5), MPI #153.

- I. Galvanized-Metal Substrates, Metal Deck Above – MPI 5.3H:
 1. Water-Based Dry-Fall System:
 - a. Prime Coat: Dry fall, water based, for galvanized steel, flat (Gloss Level 1), MPI #133.

- b. Topcoat: Dry fall, water based, for galvanized steel, flat (Gloss Level 1), MPI #133.

- J. Galvanized-Metal Substrates, Other – MPI INT 5.3M:
 - 1. High-Performance Architectural Latex System – Semi-Gloss:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 4), MPI #140.

 - 2. High-Performance Architectural Latex System – Gloss:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.

- K. Aluminum (Not Anodized or Otherwise Coated) Substrates – MPI INT 5.4F:
 - 1. High-Performance Architectural Latex System – Semi-Gloss:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 4), MPI #140.

 - 2. High-Performance Architectural Latex System – Gloss:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.

- L. Wood Substrates: Including wood trim, architectural woodwork, doors, and wood-based panel products – MPI INT 6.3T:
 - 1. Latex System – Satin Finish:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, (Gloss Level 4), MPI #43.

 - 2. Latex System – Semi-Gloss Finish:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.

- b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
 - 3. Latex System – Gloss Finish:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.
- M. Gypsum Board Substrates, Walls & Ceilings – MPI INT 9.2M:
- 1. Institutional Low-Odor/VOC Latex System – Flat Finish:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), MPI #143.
 - 2. Institutional Low-Odor/VOC Latex System – Eggshell Finish:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 3), MPI #145.
 - 3. Institutional Low-Odor/VOC Latex System – Semi-Gloss Finish:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
- N. Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings – MPI INT 10.1A:
- 1. Latex System – Flat:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

END OF SECTION

SECTION 09 93 00

STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and application of wood finishes on the following interior substrates:
 - 1. Dressed lumber (finish carpentry).
 - 2. Exposed wood panel products.

1.2 DEFINITIONS

- A. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples: For each type of finish system and in each color and gloss of topcoat.
- C. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each finish system indicated and each color 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 type of finish system and substrate.
 - 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 stain color selections will be based on mockups.
 - a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

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 finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Coronado Paint; Benjamin Moore Company.
 - 3. Frazee Paint; Comex Group.
 - 4. Glidden Professional.
 - 5. Kelly-Moore Paint Company Inc.
 - 6. Kwal Paint; Comex Group.
 - 7. Parker Paint; Comex Group.
 - 8. PPG Architectural Finishes, Inc.
 - 9. Pratt & Lambert.
 - 10. Sherwin-Williams Company (The).

2.2 MATERIALS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

- B. Material Compatibility:
 - 1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
 - 2. Shellacs, Clear: VOC not more than 730 g/L.
 - 3. Stains: VOC not more than 250 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.

- D. Stain Colors: Match Architect's samples.

2.3 WOOD FILLERS

- A. Wood Filler Paste: MPI #91.

2.4 PRIMERS AND SEALERS

- A. Alkyd, Sanding Sealer, Clear: MPI #102.

2.5 STAINS

- A. Stain, Semi-Transparent, for Interior Wood: MPI #90.

2.6 POLYURETHANE VARNISHES

- A. Varnish, Interior, Polyurethane, Oil-Modified, Satin (Gloss Level 4): MPI #57.
- B. Varnish, Interior, Polyurethane, Oil-Modified, Gloss (Gloss Level 6): MPI #56.

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 Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Stained wood substrates, nontraffic surfaces, including wood trim, architectural woodwork, and wood-based panel products – MPI INT 6.2J.

1. Polyurethane Varnish over Stain System – Satin Finish:

- a. Stain Coat: Stain, semi-transparent, for interior wood, MPI #90.
- b. First Intermediate Coat: Polyurethane varnish matching topcoat.
- c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
- d. Topcoat: Varnish, interior, polyurethane, oil-modified, satin (Gloss Level 4), MPI #57.

2. Polyurethane Varnish over Stain System – Gloss:

- a. Stain Coat: Stain, semi-transparent, for interior wood, MPI #90.
- b. First Intermediate Coat: Polyurethane varnish matching topcoat.
- c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
- d. Topcoat: Varnish, interior, polyurethane, oil-modified, gloss (Gloss Level 6), MPI #56.

B. Transparent finish wood substrates, nontraffic surfaces, including wood trim, architectural woodwork, and wood-based panel products – MPI INT 6.2H.

1. Polyurethane Varnish System – Satin Finish:

- a. Prime Coat: Polyurethane varnish matching topcoat.
- b. Intermediate Coat: Polyurethane varnish matching topcoat.
- c. Topcoat: Varnish, interior, polyurethane, oil-modified, satin (Gloss Level 4), MPI #57.

2. Polyurethane Varnish System – Gloss Finish:

- a. Prime Coat: Polyurethane varnish matching topcoat.
- b. Intermediate Coat: Polyurethane varnish matching topcoat.
- c. Topcoat: Varnish, interior, polyurethane, oil-modified, gloss (Gloss Level 6), MPI #56.

END OF SECTION

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SECTION 09 94 19

MULTICOLOR INTERIOR FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and field application of multicolor interior finishing systems on substrates indicated.

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.

1.3 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each multicolor interior finishing system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. 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.

PART 2 - PRODUCTS

2.1 MULTICOLOR FINISHING SYSTEMS

- A. Master Painters Institute (MPI) Standards: Comply with recommendations in "MPI Architectural Painting Specification Manual" applicable to products and coating systems indicated.

- B. Material Compatibility: Provide materials for use within each coating system that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Clear Wood Finishes, Varnishes: 350 g/L.
 - 5. Clear Wood Finishes, Lacquers: 550 g/L.
- D. Colors and Patterns: As indicated in color schedule on the Drawings.

2.2 MULTICOLOR COATINGS

- A. Multicolor Coating: Water- or solvent-based coat that provides a decorative polychromatic finish.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Master Coating Technologies; Scuffmaster.

2.3 FILLERS AND PRIMERS

- A. Fillers, sealers, and primers recommended in writing for use in coating systems by manufacturer of multicolor interior coating on substrates and under conditions indicated.
- B. Primer/Sealer for Multicolor Systems: Acrylic or acrylic/polyvinyl acetate (PVA) copolymer emulsion-type, pigmented primer/sealer product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

3.2 APPLICATION

- A. Apply coatings according to manufacturer's written instructions using applicators and techniques suited for coating and substrate indicated.

- B. Apply coating systems to produce uniformly textured, colored, and patterned finished-surface films without substrates, undercoats, marks, or stains showing through. Produce sharp, even glass lines and color breaks.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.3 MULTICOLOR INTERIOR FINISHING SCHEDULE

- A. Gypsum Board Substrates:
 - 1. Prime Coat: Primer/sealer for multicolor systems.
 - 2. Multicolor Base Coat: Multicolor coating.
 - 3. Multicolor Pattern Coat: Multicolor coating.

END OF SECTION

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SECTION 09 97 37

DRY ERASE COATING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies field-applied dry erase coatings including surface preparation and primer.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Maintenance Instructions: Provide precautions against cleaning materials and methods that may be detrimental to finish and performance.
- C. Samples: Submit verification sample of specified color on manufacturer's standard sample card.

1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Comply with fire performance characteristics indicated below. Identify components with markings from testing and inspection organization.
 - 1. ASTM E-84 (Fuel Contribution) - Class A, flame spread 5, smoke developed 0.
- B. Manufacturer Qualifications: Minimum 3 years manufacturing dry erase coatings.
- C. Mock-ups: Prepare mock-ups for Architect's review and to establish requirements for substrate finish and final coating application, texture and color.
 - 1. Install dry erase coatings mock-up in area designated by Architect.
 - 2. Correct areas, modify method of application/installation, or adjust finish texture as directed by Architect to comply with specified requirements.
 - 3. Maintain mock-ups accessible to serve as a standard of quality for this Section.
 - 4. Accepted mock-ups may remain in place.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original factory wrappings and containers, clearly labeled with manufacturer, product name, and fire hazard classification.
- B. Store materials in original undamaged packages and containers inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Store at temperatures above 40 degrees F. Do not allow product to freeze.

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperature not less than 68 deg F minimum and 85 deg F maximum 72 hours prior to beginning of installation.
 - 1. Do not install dry erase coatings until the space is enclosed and weatherproof.
 - 2. Do not install dry erase coatings until temperature is stabilized and permanent lighting is in place.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by the following:
 - 1. IdeaPaint; 40 Broad Street, 1st Floor, Boston, MA 02109; telephone: 617-714-1050; website: www.ideapaint.com
- B. Dry Erase Coating: IdeaPaint™ PRO, 2-part, solvent-based coating by IdeaPaint, providing a surface suitable for use of dry eraser markers.
 - 1. Color: As selected by Architect from Manufacturer's standard colors as follows:
 - a. Color: White.
 - b. Color: White sand.
 - c. Color: Light gray.
 - d. Color: Custom, match Architect's sample.
 - 2. VOC (EPA Method 24 or ASTM D3960): 325 g/L.
 - 3. Coverage: 1 quart per 50 sf (4.6 sq. m).
 - 4. Density (mixed) (ASTM D1475) 10.37 lbs/gal.
 - 5. Opacity/Hiding Power (ASTM D2805): 96%.
 - 6. Sag Resistance (ASTM D4400): 8.
 - 7. Flow and Leveling (ASTM D2801): 10.
 - 8. Crack Resistance (ASTM D522): 21%.
 - 9. Finish/Gloss (ASTM D523) on Dry Wall board:
 - a. 20 degrees: 26.6
 - b. 60 degrees: 71.0
 - c. 85 degrees: 68.0
 - 10. Scrub Resistance (ASTM D2486): Breakthrough at 15,600 Cycles.

11. Stain Removal/Washability (ASTM D3450): >99.55%.
 12. QUV (ASTM D4587) Status after 500 hours:
 - a. White Board: Brightness for White Board QUV = 91.44, DE = 2.01.
Observation: Not as blue, acceptable; performance acceptable.
 - b. Black Board: Brightness for Black Board QUV = 91.73, DE = 1.86.
Observation: Not as blue, acceptable; performance acceptable.
 13. Thermal: KCMA ANSI-A161.1-1995 Method 9.2, 26 cycle no cracking observed.
 14. Flashpoint (open cup) (ASTM D92): 80 degrees F (26.7 C).
 15. Flammability Limit: ASTM E682, lower flammability limit 1.69 percent at 212 degrees F (100 degrees C); upper flammability limit greater than 9.44 percent at 212 degrees F (100 degrees C).
 16. Fire Rating (ASTM E84): Flame 5, Smoke 0 or Class 1 or Class A.
- C. Primer: IdeaPaint PRIMER, Sherwin-Williams Multi-Purpose, PPG Seal Grip, Glidden Gripper or Kilz Premium. Visit <http://learn.ideapaint.com/preferred-products> for a complete list of primers.
- D. Roller Covers: 9 inch wide FoamPro roller cover by FoamPro. **No substitutions.**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions in which dry erase coatings will be installed.
1. Complete finishing operations, including painting, before beginning installation of dry erase coatings.
 2. Wall surfaces to receive dry erase coatings shall be dry and free from dirt, grease, loose paint, and scale.
 3. Do not proceed with installations until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Remove hardware, accessories, plates and similar items to allow dry erase coatings to be installed.
1. Repair damaged areas by filling voids with spackle. Sand smooth repaired or textured surfaces. Scuff glossy and non-porous surfaces using medium grit sandpaper. Paint product is a high gloss coating; imperfections and visible seams will telegraph.
 2. Plaster Surface: Remove surface chalk. In new work use moisture meter to determine moisture content. Do not begin installation when moisture content is greater than five percent.
 3. Gypsum Board Surface: Provide Level 4 finish per ASTM C840 and GA214. Recess nails and screws. Repair irregular tape joints, sand and remove dust.

4. Previously Painted Surface: Remove loose paint or scale. Sand surface of enamel or gloss paint and remove dust with tack cloth or denatured alcohol.
- B. Prime substrate using materials recommended by manufacturer. Prime surface until the color of the existing surface does not show through.
- C. Ventilate area thoroughly to prevent the odor from permeating to other areas in the building. Provide 100 percent outside air ventilation of application areas.

3.3 APPLICATION

- A. Comply with manufacturers printed installation instructions. Mix components in strict accordance with manufacturer's instructions. Pot life is 1 hour maximum.
- B. Apply dry erase coating with specified roller only. Comply with the following:
 1. Apply heavy single coat ONLY. Do not recoat or touch up applied coating.
 2. Paint surface by working from one end to the other.
 3. Begin by cutting in the edges of an approximately 2 foot wide section.
 4. Paint 2 foot wide section, maintaining a wet edge.
 5. Roll new section into wet edge.
 6. Continuously check for skips, holes, and holidays as application progresses.
 7. Remove masking tape within 1 hour of painting.
- C. Coating shall cure for a minimum of 7 days after application before use.
- D. Application Rate: Maximum 50 square feet per quart.

3.4 CLEANING & REPAIR

- A. Daily erasing and cleaning should be done with a standard dry erase eraser, dry cotton cloth, or micro-fiber towel. Be sure to use clean erasers. For periodic and more thorough cleaning use a clean damp cloth or dry erase cleaner or wipes.
- B. If damaged, the original surface should be deglossed by scuffing surface and priming before recoating with IdeaPaint.

3.5 PROTECTION

- A. Protect installed product and finished surfaces from damage during construction.

END OF SECTION

SECTION 10 11 16.16
GLASS MARKER BOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Glass markerboards.

1.2 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, if required.
 3. Include sections of typical trim members.
- C. Samples: 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. Include accessory Samples to verify color selected.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For visual display units to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.5 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.

1.6 PROJECT 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.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 GLASS MARKERBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Clarus Glassboards, LLC; Glassboard Depth, or comparable product by one of the following:
 - 1. A-1 Visual Systems.
 - 2. Architectural School Products Ltd.
 - 3. Best-Rite; MooreCo, Inc.
 - 4. Claridge Products and Equipment, Inc.
 - 5. Egan Visual Inc.
 - 6. Ghent Manufacturing, Inc.
 - 7. Marsh Industries, Inc.
- B. Glass Markerboards: 6-mm tempered glass markerboard, with smooth polished edge and eased corners; color coated on back surface.
- C. Mounting: Round, stainless-steel standoffs, holding glass approximately 1 inch from wall surface; mounted through holes in markerboard.
- D. Color and Gloss: As indicated on Drawings.

E. Marker Tray: Aluminum, fastened to wall beneath markerboard.

1. Provide one set of five colored markers per markerboard.

F. Size: As indicated on Drawings.

2.3 MATERIALS

A. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.

B. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

C. Appearance of Finished Work: Noticeable variations in same piece are 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.

2.5 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.

3.3 INSTALLATION

- A. 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. .
- B. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
 - 1. Mounting Height: As indicated on Drawings.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to 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

SECTION 10 21 13.13
METAL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes painted steel toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, and attachment details.
- C. Samples for each type of toilet compartment material indicated.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 PAINTED STEEL TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Accurate Partitions Corporation.
 - 2. Bradley Corporation; Mills Partitions.
 - 3. Flush Metal Partition Corp.
 - 4. General Partitions Mfg. Corp.
 - 5. Global Steel Products Corp.
 - 6. Hadrian Manufacturing Inc.

7. Knickerbocker Partition Corporation.
 8. Metpar Corp.
- B. Toilet-Enclosure Style: From the following options, as indicated on Drawings:
1. Overhead braced.
 2. Floor anchored.
 3. Ceiling hung.
 4. Floor and ceiling anchored.
- C. Urinal-Screen Style: Wall hung, flat panel.
- D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least 250 lbf, when tested according to ASTM F 446, without deformation of panel.
 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
- E. Urinal-Screen Construction:
1. Flat-Panel Urinal Screen: Matching panel construction.
- F. Facing Sheets and Closures: Electrolytically coated steel or hot-dip galvanized-steel sheet with nominal base-metal (uncoated) thicknesses as follows:
1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.036 inch.
 2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.048 inch.
 3. Panels: Manufacturer's standard thickness, but not less than 0.030 inch.
 4. Doors: Manufacturer's standard thickness, but not less than 0.030 inch.
 5. Flat-Panel Urinal Screens: Thickness matching the panels.
- G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
- H. Brackets (Fittings):
1. Stirrup Type: Ear or U-brackets; stainless steel or chrome-plated brass.
- I. Steel Sheet Finish: Manufacturer's standard baked-on finish.

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

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
 1. Material: Chrome-plated brass.
 2. Provide units that comply with regulatory requirements for accessibility 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 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories, and solid blocking within panel 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. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Ceiling-Hung Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- E. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position indicated with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Corner guards.

B. Related Sections:

1. Section 08 71 00 "Door Hardware" for metal armor, kick, mop, and push plates.

1.2 ACTION SUBMITTALS

- A. Product Data:** Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

- B. Shop Drawings:** For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.

- C. Samples:** For each type of exposed finish required, prepared on Samples of size indicated below.

1. Wall and Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data:** For each impact-resistant wall protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:** An employer of workers trained and approved by manufacturer.

- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 01 45 16 "Contractor's Quality Control."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration materials beyond normal use.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.

- B. Stainless-Steel Sheet: ASTM A 240/A 240M.
- C. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated from one-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arden Architectural Specialties, Inc.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - e. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - f. Pawling Corporation.
 - 2. Material: One of the following as indicated on Drawings
 - a. Stainless steel, Type 304.
 - 1) Thickness: Minimum 0.0500 inch.
 - 2) Finish: Directional satin, No. 4.
 - b. Extruded aluminum, minimum 0.0625 inch thick, with clear anodic finish.
 - 3. Wing Size: As indicated on Drawings.
 - 4. Height: As indicated on Drawings.
 - 5. Corner Radius: 1/8 inch.
 - 6. Mounting: Adhesive.

2.3 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

2.4 METAL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 3. Run grain of directional finishes with long dimension of each piece.

4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions.
1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 10 28 13
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Toilet 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 indicated.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TOILET ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
 - 1. American Dryer, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. Excel Dryer Corporation.
 - 6. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
 - 7. World Dryer Corporation.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of three keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

END OF SECTION

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SECTION 10 44 13
FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fire-protection cabinets for portable fire extinguishers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.
- C. Coordinate fire-rating of cabinets with fire-rating of wall in which cabinet is located.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINETS

- A. Cabinet Type: Suitable for size of fire extinguisher specified.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Larsens Manufacturing Company.
 - c. Nystrom, Inc.
 - d. Potter Roemer LLC.
- B. Cabinet Construction: Nonrated or fire-rated as required.
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: As indicated on the Drawings from the following options:
1. Cold-rolled steel sheet.
 2. Stainless-steel sheet.
 3. Copper-alloy brass sheet.
 4. Copper-alloy bronze sheet.
- D. Fire Extinguisher Mounting Style: As indicated on the Drawings from the following options:
1. Recessed Cabinets: Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 2. Semirecessed Cabinets: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Rolled-Edge Trim: 2-1/2-inch backbend depth.
 3. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- E. Cabinet and Door Trim Material: As indicated on the Drawings from the following options:
1. Cold-rolled steel sheet.
 2. Stainless-steel sheet.
 3. Copper-alloy brass sheet.
 4. Copper-alloy bronze sheet.
- F. Door Style: Vertical duo panel with frame.
- G. Door Glazing: Acrylic sheet.
1. Acrylic Sheet Color: Clear transparent acrylic sheet.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- I. Accessories:

1. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.

J. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: White.
2. Stainless Steel: ASTM A 666, Type 304.
 - a. Finish: No. 4 directional satin finish.
3. Copper Alloy, Brass: ASTM B 36/B 36M, alloy as standard with manufacturer.
 - a. Finish: Satin.
4. Copper Alloy, Bronze: ASTM B 36/B 36M, alloy as standard with manufacturer.
 - a. Finish: Satin oxidized oil rub.
5. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

2.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare recesses for recessed and semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.
- B. Install fire-protection cabinets in locations indicated or, if not indicated, at a minimum rate of one fire protection cabinet for each 6,000 sq. ft. of floor area or fraction thereof.

- 1. Mounting Height: 54 inches above finished floor to top of cabinet.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Identification: Apply vinyl lettering at locations indicated.
- E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that latching devices operate properly.

END OF SECTION

SECTION 10 44 16
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet or mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ansul Incorporated.
 - b. Badger Fire Protection.
 - c. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - d. Larsens Manufacturing Company.
 - e. Nystrom Building Products.
 - f. Potter Roemer LLC.
 - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers in locations indicated or, if not indicated, at a minimum rate of one fire extinguisher for each 6,000 sq. ft. of floor area or fraction thereof.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

1. Mounting Height: 54 inches above finished floor to top of fire extinguisher.

END OF SECTION

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SECTION 12 36 61.16
SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes solid surface material countertops.

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.
- C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Products: Subject to compliance with requirements, provide products indicated on Drawings.
 - a. Type: Provide Standard type or Veneer type made from material complying with requirements for Standard type, as indicated unless Special Purpose type is indicated.
 - b. Colors and Patterns: As indicated on Drawings.
- B. Composite Wood Products: Products shall be made without urea formaldehyde.
 - 1. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130 .

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.

- B. Configuration:
 - 1. Front Edge: As indicated on Drawings.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. End Splash: Matching backsplash.
- C. Countertops: One of the following:
 - 1. 1/2-inch-thick, solid surface material with front edge built up with same material to profile indicated.
 - 2. 1/4-inch-thick, solid surface material laminated to 3/4-inch-thick MDF with front edge built up to profile indicated.
- D. Backsplashes: 3/4-inch-thick, solid surface material.
- E. Joints: Fabricate countertops without joints wherever possible. Fabricate oversized countertops in sections for joining in field, with joints at locations indicated on approved Shop Drawings.
- F. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less.
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- B. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions.
- C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.

- E. Install aprons to backing and countertops with adhesive.
- F. 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.
- G. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION

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SECTION 12 36 61.19

QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes quartz agglomerate countertops.

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.
- C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
 - 1. Products: Subject to compliance with requirements, provide products indicated on Drawings.
 - a. Colors and Patterns: As indicated on Drawings.
- B. Composite Wood Products: Products shall be made without urea formaldehyde.
 - 1. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130 .

2.2 COUNTERTOP 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 Edge: As indicated on Drawings.
 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. Joints: Fabricate countertops without joints wherever possible. Fabricate oversized countertops in sections for joining in field, with joints at locations indicated on approved Shop Drawings.
- F. Cutouts and Holes:
1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.
1. Adhesives shall have a VOC content of 70 g/L or less.
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- B. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions.
- C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.
- E. Install aprons to backing and countertops with adhesive.
- F. 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.

G. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION

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PLUMBING

DIVISION 22

- 22 00 10 Basic Plumbing Requirements
- 22 00 90 Plumbing Submittal Procedures
- 22 05 24 Valves - General
- 22 05 30 Pipe And Pipe Fittings - General
- 22 05 54 Plumbing Identification
- 22 07 20 Piping Insulation
- 22 11 17 Domestic Water Piping & Appurtenances
- 22 13 17 Soil, Waste & Sanitary Drain Piping, Vent Piping & Appurtenances
- 22 13 18 Condensate Piping
- 22 33 34 Access Doors
- 22 40 01 Plumbing Fixtures And Fixture Carriers



7-1-16

1 SECTION 22 00 10

2
3 BASIC PLUMBING REQUIREMENTS

4
5
6 PART 1 GENERAL

7
8 1.1 DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

12
13 1.2 SECTION INCLUDES

- 14
15 A. Basic plumbing requirements necessary to provide complete installation of all Division
16 22 work.

17
18 1.3 WORK INCLUDED

- 19
20 A. This section of work comprises furnishing of all materials, equipment, tools, scaffolding,
21 rigging, hoisting, labor and transportation necessary for the complete installation of the
22 plumbing systems as shown on the plans and as specified herein.

- 23
24 B. Bidders shall determine the contents of a complete set of drawings and specifications and
25 be aware that they may be bidding from a partial set of drawings, applicable only to the
26 various separate contracts, subcontracts, or trades as may be issued for bidding purposes
27 only. The contract documents and the complete scope of work for the project are
28 illustrated on the combined Architectural, Structural, Mechanical, Heating, Ventilating,
29 Air Conditioning, Plumbing and Electrical, and each Bidder shall thoroughly acquaint
30 himself with all the details of the complete set of drawings and specifications before
31 submitting his bid.

- 32
33 C. All drawings and specifications form a part of the contract documents for each separate
34 contract and shall be considered as bound therewith in the event partial sets of plans and
35 specifications are issued for bidding only. The submission of bids shall be deemed
36 evidence of the review and examination of all drawings, specifications, and addenda issued
37 for this project as no allowances will be made because of unfamiliarity with any portion
38 of the complete set of documents.

39
40 1.4 RELATED SECTIONS

- 41
42 A. The conditions of the Division 01 requirements and the contract requirements which
43 include the General Conditions and the Supplementary Conditions apply to the work of
44 this division.

1 1.5 CODES & REFERENCE STANDARDS

2
3 A. General

- 4 1. Perform all Division 22 work in strict accordance with the requirements and
5 recommendations stated in the codes and standards except when requirements are
6 modified by the contract documents.
7 2. Nothing in the Contract Documents shall be construed to permit work not
8 conforming to these codes.
9 3. When two or more codes or standards are applicable to the same work, then the
10 stricter code or standard shall govern.
11 4. The date of the code or standard that is in effect on the date of issue of the contract
12 documents except when a particular publication date is specified.
13 5. The Contractor shall be held responsible for verifying all local codes and ordinances
14 that may alter any part of the plans or specifications. The Contractor shall bear all
15 costs for correcting the deficiencies.
16 6. Where local codes and ordinances are not in writing or on record but a local
17 precedence has been set, the Owner shall pay for any additional cost incurred.

18
19 1.6 APPLICABLE CODES AND STANDARDS FOR ALL DIVISIONS 22 WORK

20
21 A. International Building Code

22
23 B. International Gas Code

24
25 C. International Plumbing Code

26
27 D. International Mechanical Code

28
29 E. International Energy Conservation Code

30
31 F. National Electrical Code

32
33 G. American Society of Heating, Refrigerating and Air Conditioning Engineers Standards.

34
35 H. Occupational Safety and Health Administration Standards:

- 36 1. OSHA Standard 2207 - Construction Industry Standards
37 2. OSHA 29 CFR Part 1926 – Regulation of Excavation
38 3. Texas Underground Facility Damage Prevention Act (H.B. 2295)
39 4. All other applicable standards

40
41 I. National Fire Protection Association:

- 42 1. NFPA No. 90A Installation of Air Conditioning and Ventilating Systems

43
44 J. Fire Sprinkler System:

- 45 1. NFPA 13
46 2. NFPA 14

- 1 3. NFPA Life Safety Code 101 Section 8-3
2 4. All other applicable codes
3
4 K. National Appliance Energy Conservation Act of 1987
5
6 L. Texas State Board of Insurance Standards
7
8 M. Clean Air Act and Clean Air Act Amendments of 1990
9
10 N. State Codes:
11 1. Texas Department of Labor Boiler Rules and Regulations
12 2. All other applicable codes
13
14 O. Local Municipal Codes and Ordinances
15
16 P. Schedule of Abbreviations:
17 1. Reference Standards are listed in Division 22 using abbreviations listed below:
18 AABC Associated Air Balance Council
19 AASHTO American Association of State Highway and Transportation
20 Officials
21 ADA Americans with Disabilities Act
22 AGA American Gas Association
23 ANSI American National Standards Institute
24 ASME American Society of Mechanical Engineers
25 ASPE American Society of Plumbing Engineers
26 ASTM American Society for Testing and Materials
27 AWE American Welding Society
28 AWWA American Water Works Association
29 CISPI Cast Iron Soil Pipe Institute
30 CS Commercial Standard
31 DIPRA Ductile Iron Pipe Research Association
32 DOT Department of Transportation
33 DOC Department of Commerce
34 FCC Federal Communications Commission
35 FM Factory Mutual
36 FS Federal Specification
37 IBC International Building Code
38 ITL Independent Testing Laboratories
39 NEC National Electric Code
40 NFPA National Fire Protection Association
41 NSF National Sanitation Foundation
42 OSHA Occupational Safety and Health Administration
43 PDI Plumbing and Drainage Institute
44 SMACNA Sheet Metal and Air Conditioning National Association
45 TDH Texas Department of Health
46 TWC Texas Water Commission
47 UL Underwriters Laboratories

1 1.7 QUALITY ASSURANCE

- 2
- 3 A. Provide complete installations of all systems.
- 4
- 5 B. Furnish all items of equipment, material, and labor to complete the Contract even though
- 6 each and every item necessary is not specifically mentioned or shown.
- 7
- 8 C. In case of any conflict between the specifications, plans and ordinances, the ordinances
- 9 shall govern.
- 10
- 11 D. All materials furnished under this Contract shall be new, free from defects of any kind,
- 12 of the quality and design hereinafter specified, and shall conform to the standards of
- 13 Underwriter's Laboratories Inc., except for equipment which U.L. does not list or provide
- 14 label service.
- 15
- 16 E. All plumbing equipment and fixtures shall be the same brand unless scheduled differently
- 17 on plans.
- 18

19 1.8 CONTRACTOR'S RESPONSIBILITY

- 20
- 21 A. Erect barricades, protective fencing, and signs to prevent injury to personnel on site.
- 22
- 23 B. Make permanent connection to utilities or existing lines. Determine depth and location,
- 24 and bid accordingly.
- 25
- 26 C. Relocate and repair any existing lines cut by general construction work.
- 27
- 28 D. Pay all costs in connection with metering devices.
- 29
- 30 E. Plans do not show exact location and elevations of lines, nor do they show all offsets
- 31 required.
- 32
- 33 F. Deviate from plans as required to conform to the general construction and provide
- 34 proper grading.
- 35
- 36 G. Maintain all utility services during construction to existing portions of job that remain.
- 37
- 38 H. Procure and pay for all necessary permits or licenses to carry out the work.
- 39
- 40 I. Obtain and pay for all the necessary certificates of approval which must be delivered to
- 41 the Architect before final acceptance of the work.
- 42
- 43 J. Periodically remove rubbish, clean or repair all surfaces marred by the work required
- 44 under this contract.
- 45
- 46 K. Protect work from damage by other trades.
- 47

- 1 L. Make all tests required by law; pay all costs in connection with the testing.
2
3 M. Where job conditions require changes in indicated locations and arrangement, make such
4 changes without extra cost to Owner.
5
6 N. Provide motor starters, controls, relays, all low-voltage wiring, conduit and wiring related
7 to plumbing and other equipment and devices to form a complete working system. See
8 Division 26 00 00.
9

10 1.9 DEFINITIONS
11

12 A. Approval:

- 13 1. It is understood that approval must be obtained from the Architect in writing before
14 proceeding with the proposed work.
15 2. Approval by the Architect of any changes, submitted by the Contractor will be
16 considered as general only to aid the Contractor in expediting his work.
17

18 B. Contractor:

- 19 1. The Contractor engaged to execute the work included in a particular section only,
20 even though he may be technically described as a Subcontractor to the General
21 Contractor.
22 2. If the Contractor engaged to execute said work employs Sub-Contractors to perform
23 various portions of the work included under this Section, he shall be held responsible
24 for the execution of same, in full conformity with Contract Document requirements.
25 3. The Contractor shall cooperate at all times and shall be responsible for the
26 satisfactory cooperation of his Subcontractors with the other Contractors on the job
27 so that all of the various phases of the work may be properly coordinated without
28 unnecessary delays or damage to any parts of the work of any Contractor.
29

30 C. Provide:

- 31 1. Defined as requiring the furnishing and installing of the item or facility indicated,
32 complete in all respects and ready for operation unless otherwise specifically noted.
33

34 1.10 WARRANTY
35

- 36 A. The Contractor shall warranty his work against defective materials and workmanship for
37 a period of one year from date of acceptance of the job.
38
39 B. Neither the final payment nor any provisions in Contract Documents shall relieve the
40 Contractor of the responsibility for faulty materials or workmanship.
41
42 C. He shall remedy any defects due thereto, and pay for any damage to other work resulting
43 therefrom, which shall appear within a period of one year from date of substantial
44 completion.
45
46 D. The Owner shall give notice of observed defects with reasonable promptness.
47

1 E. This Guarantee shall not be construed to include the normal maintenance of the various
2 components of the system covered by these specifications.

3
4 1.11 SITE VISIT

5
6 A. Before submitting his proposal, each bidder shall examine all plans and specifications
7 relating to the work, shall visit the site of the project and become fully informed of the
8 extent and character of the work required.

9
10 B. No consideration will be granted for any alleged misunderstanding of the materials to be
11 furnished or the amount of work to be done, it being fully understood that the tender of
12 a proposal carries with it the agreement to all items and conditions referred to herein, or
13 indicated on the accompanying plans or required by nature of the site of which may be
14 fairly implied as essential to the execution and completion of any and all parts of the work.

15
16 1.12 SUBMITTALS

17
18 A. Submittal Procedures:

19 1. Bidding requirements, contract forms, conditions of the contract, Division 1 -
20 General Requirements and Division 22 apply to work of this division, in addition to
21 the following:

22 a. The materials, workmanship, design, and arrangement of all work installed
23 under this contract shall be subject to the review of the Architect, Engineer and
24 Owner.

25 b. Where specified materials, process, or methods of construction or manufactured
26 article is specified by name or by reference to the catalog number of a
27 manufacturer, the specifications are to be used as a guide and are not intended
28 to take precedence over the basic duty and performance specified or noted on
29 the Drawings.

30 c. In all cases, the Contractor shall verify the duty and available electric
31 characteristics with the specific characteristics of the equipment offered for
32 review. All component parts of each item of equipment or device shall bear the
33 manufacturer's name plate giving name of manufacturer, description, size, type,
34 serial or model number, electrical characteristics, etc., in order to facilitate
35 maintenance or replacement.

36 d. Unapproved Products: If materials or equipment are installed before being
37 reviewed and approved by the engineer, the contractor shall be liable for the
38 removal and replacement of such unapproved materials and equipment, at no
39 additional expense to the owner. Additionally, if the removal and replacement
40 of unapproved materials or equipment necessitates the removal and replacement
41 of other related materials or equipment, then the contractor shall be liable for
42 the removal and replacement of the related materials and equipment at no
43 additional expense to the owner.

44 e. This Contractor shall call to the attention of the Architect/Engineer by letter or
45 on shop drawing submittals, any instance in which the shop drawings differ
46 from the requirements of the Drawings and Specifications.

- 1 f. Data and shop drawings shall be coordinated and included in a single
2 submission. Multiple submissions are not acceptable except where prior
3 approval has been obtained from the Architect/Engineer. In such cases, a list
4 of data to be submitted later shall be included with the first submission. Failure
5 to submit shop drawings that meet the requirements of the Drawings and
6 Specifications in ample time for review shall not entitle the Contractor to an
7 extension of contract time, and no claim for extension by reason of such default
8 shall be allowed.
- 9 g. Catalogs, pamphlets, or other documents submitted to describe items on which
10 review is being requested shall be specific and identifications in catalog,
11 pamphlets, etc., of items submitted shall be clearly made in a contrasting ink.
12 Data of a general nature shall not be acceptable. Data and shop drawings shall
13 be identified in accordance with Division 01. In addition, shop drawings shall
14 be identified by the name of the item and system and the applicable Specification
15 paragraph number.
- 16 h. Electronic Submittals: Electronic submittal requirements will be determined by
17 the Architect. If this method is required then the procedures described in this
18 section shall be modified as follows:
- 19 (1) The contractor shall supply only one copy of the submittal, rather than the
20 six copies described in this section. The submittal shall be accompanied by
21 a letter stating that the contractor desires the response in electronic form,
22 and that prior approval for this method has been granted.
- 23 (2) After reviewing the submittal, the engineer will create electronic files from
24 the reviewed submittal material.
- 25 (3) The electronic files will either be mailed to the architect, or posted to a web
26 site, depending on the architect's requirements. The architect and
27 contractor can distribute copies of the files as desired.
- 28 (4) The engineer will retain the paper copy of the submittal as a file copy.

29
30 B. Product Data:

- 31 1. Where the content of manufacturer submittal literature includes data not pertinent
32 to the submittal, clearly indicate which portions of the contents are being submitted
33 for review. Catalogs, pamphlets, or other documents submitted to describe items on
34 which review is being requested shall be specific and identifications in catalog,
35 pamphlets, etc., of items submitted shall be clearly made in a contrasting ink or
36 highlighting. Data of a general nature shall not be acceptable.

- 37
38 C. Coordination Correspondence: The contractor may desire to verify the acceptability of a
39 particular item prior to assembling the initial submittal package. The contractor may send
40 material directly to the engineer for comments and feedback. This communication,
41 whether by mail, fax, or e-mail, will be treated as normal coordination correspondence
42 and will not be tracked or documented as a formal submittal. The engineer may or may
43 not respond to such correspondence. If the engineer agrees, in writing, to the use of a
44 particular item, then that same material shall be included in the initial submittal package
45 along with a copy of the correspondence.
- 46

1 D. Submittal Preparation:

- 2 1. Minimum of six copies are required, complete (all items submitted at one time), index
3 to each Section of Specifications requiring submittals, and include the following
4 information and action taken.
- 5 2. **Organize all required data in a 3-ring black (in color) of sufficient size, hard
6 cover binder, complete with index tabs, and appropriate title of specification
7 section.**
- 8 a. Project Name
 - 9 b. Date
 - 10 c. Name and Address of Architect
 - 11 d. Name and Address of Engineer
 - 12 e. (See Division 01 of Specifications)
 - 13 f. Name, Address and Telephone Number of Contractor or Sub-contractors.
 - 14 g. Manufacturer's Name
 - 15 h. Published ratings or capacity data
 - 16 i. Detailed equipment drawing for fabricated items
 - 17 j. Panel diagrams
 - 18 k. Wiring diagrams
 - 19 l. Installation instructions
 - 20 m. Mechanical room layout of all HVAC equipment and other equipment drawn
21 to 1/4" = 1'-0" scale and dimensioned.
 - 22 n. Other pertinent data
 - 23 o. **All required submittals and data, bound together, submitted at one time.**
- 24

25 E. Submittal Organization:

- 26 1. Organize all required data in a 3-ring black (in color) of sufficient size, hard cover
27 binder, complete with index tabs, and appropriate title of specification section.
28 Submit the following sections:
- 29 22 00 10 Basic Plumbing Requirements
 - 30 22 00 90 Plumbing Submittal Procedures
 - 31 22 05 24 Valves - General
 - 32 22 05 30 Pipe And Pipe Fittings - General
 - 33 22 05 54 Plumbing Identification
 - 34 22 07 20 Piping Insulation
 - 35 22 11 17 Domestic Water Piping & Appurtenances
 - 36 22 13 17 Soil, Waste & Sanitary Drain Piping, Vent Piping & Appurtenances
 - 37 22 13 18 Condensate Piping
 - 38 22 33 34 Access Doors
 - 39 22 40 01 Plumbing Fixtures And Fixture Carriers
- 40 2. Provide a cover sheet and an index sheet listing all items submitted. The second and
41 third sheet shall be blank for stamping of submittals.
- 42 3. The successful review rendered on shop drawings shall not be considered as a
43 guarantee of building conditions. Where drawings have been successfully reviewed,
44 said review does not mean that the drawings have been checked in detail and does
45 not in any way relieve the Contractor from the responsibility, nor the necessity of
46 furnishing the material or performing the work as required by the Drawings and
47 Specifications.

- 1 4. All equipment and materials to be furnished under this Division of these
2 Specifications shall be as manufactured by the manufacturer(s) listed on the
3 Drawings, herein specified, or accepted by addendum.
- 4 5. The Engineer's review of submittals is only for confirmation of adherence to design
5 of project and does not relieve the Contractor of responsibility of furnishing all
6 material for a complete working system and equivalent products as specified.
- 7 6. The Mechanical Contractor shall submit a schematic of all control wiring for all
8 equipment. This can be a manufacturer's diagram. A copy of the control schematic
9 shall be submitted to the Electrical Contractor at the same time for his comments.
10 No submittal will be reviewed until all control diagrams are submitted.
- 11 7. Mechanical Contractor and Plumbing Contractor shall submit 1/4 inch per foot shop
12 drawing(s) showing all piping, ductwork and equipment shown by the plans and
13 specifications. The drawing(s) shall be coordinated with structural drawings and all
14 other trades especially the fire sprinkler (if required) and electrical. A reproducible
15 drawing shall be corrected to "as built" and submitted to Owner at the termination
16 of the project. If contractor has obtained an electronic copy of construction
17 documents merely reproducing these drawings will not be acceptable.

18 19 1.13 PROJECT RECORD DOCUMENTS

- 20
21 A. The Contractor shall keep a set of plans on the job, noting daily all changes made in
22 connection with the final installation including exact dimensioned locations of all new
23 and uncovered existing utility piping outside the building.
- 24
25 B. Upon submitting his request for final payment, he shall turn over to the
26 Architect/Engineer, for subsequent transmittal to the Owner, a clean, neatly marked set
27 of reproducible plans showing "as installed" work and an electronic file with changes of
28 materials.
- 29
30 C. In addition to the above, the Contractor shall accumulate during the job's progress the
31 following data, in duplication (2 each), prepared in 3 ring binders of sufficient size, black
32 in color, neat in appearance, and turned over to the Architect/Engineer for checking and
33 subsequent delivery to the Owner:
 - 34 1. All warranties, guarantees and manufacturer's directions on equipment and material
35 covered by the Contract.
 - 36 2. Approved fixture brochures.
 - 37 3. Copies of reviewed shop drawings.
 - 38 4. Set of operating instructions. Operating instructions shall also include recommended
39 maintenance.
 - 40 5. Any and all other data and/or plans required during construction.
 - 41 6. Repair parts lists of all major items and equipment including name, address and
42 telephone number of local supplier or agent.
 - 43 7. The first page, or pages, shall have the names, addresses, and telephone numbers of
44 the following:
 - 45 a. General Contractor and all sub-contractors.
 - 46 b. Major Equipment Suppliers.

1 1.14 TRAINING

- 2
- 3 A. Upon completion of the work and at a time designated by the Owner's representative,
- 4 provide a formal training session for the Owner's operating personnel to include location,
- 5 operation, and maintenance of all plumbing equipment and systems, some sections have
- 6 further instructions.
- 7
- 8 B. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects
- 9 that will be covered. Submit the outline for review by the Owner's representative.
- 10
- 11 C. At the conclusion of the instruction, obtain the signatures of the attendees on each copy
- 12 of the outline to signify that they have a proper understanding of the operation and
- 13 maintenance of the system. Submit the signed outlines to the Owner's representative and
- 14 Engineer as a condition of final acceptance.
- 15

16 1.15 PLANS AND SPECIFICATIONS

- 17
- 18 A. The plans show diagrammatically the locations of the various lines, ducts, conduits,
- 19 fixtures, and equipment and the method of connecting and controlling them.
- 20
- 21 B. It is not intended to show every connection in detail and all fittings required for a
- 22 complete system.
- 23
- 24 C. The systems shall include but are not limited to the items shown on the plans.
- 25
- 26 D. Exact locations of these items shall be determined by reference to the general plans and
- 27 measurements of the building and in cooperation with other Contractors, and in all cases,
- 28 shall be subject to the approval of the Architect/Engineer.
- 29
- 30 E. The Architect/Engineer reserves the right to make any reasonable change in the location
- 31 of any part of this work without additional cost to the Owner.
- 32
- 33 F. Contractor, subcontractor, vendors and suppliers are required to waive subrogation
- 34 against Owner and Engineer.
- 35

36 1.16 UTILITIES, LOCATIONS, AND ELEVATIONS

- 37
- 38 A. Locations and elevations of the various utilities within the scope of this work have been
- 39 obtained from the City and/or other substantially reliable sources and are offered
- 40 separately from the Contract documents, as a general guide only, without guarantees as
- 41 to accuracy.
- 42
- 43 B. The Contractor shall examine the site, shall verify to his own satisfaction the locations,
- 44 elevations and availability of all utilities and services required, and shall adequately inform
- 45 himself as to their relation to the work; the submission of bids shall be deemed evidence
- 46 thereof.
- 47

- 1 C. The Contractor shall coordinate all services with the Utility Companies during
2 construction, coordinate changes made by Utility Companies to the design of project, and
3 coordinate with the Owner, Architect/Engineer, and Utility the scheduling of any
4 shutdowns or delays that may occur in providing service.
5
6 D. The Contractor shall verify location, conduct all necessary tests, inspections, coordinate
7 with Owner's representatives and utilities, and check for existing underground utilities
8 and lines before ditching.
9
10 E. The Contractor shall be responsible for repair of any cut or damaged lines or utilities he
11 uncovers. There are lines and utilities not shown on any plans.
12
13 F. Contractor is responsible for coordination of all existing and new utilities at site.
14 Contractor is responsible for protecting and repairing any utilities damaged by installation
15 of pipe. All existing and new landscaping/trees to remain and to be protected unless
16 directed otherwise by Architect/Owner.

17
18 1.17 SUBSTITUTION OF PRODUCTS
19

- 20 A. Substitution of products specified herein will be considered only when a complete list of
21 proposed alternative equipment is submitted to the Engineer in writing, supported by
22 adequate technical and cost data. This includes a complete description of the proposed
23 substitution, drawings, catalog cuts, performance data, test data, or any other data or
24 information necessary for evaluation.
25
26 B. All proposed substitutions and data must be received by the Engineer no less than ten
27 working days prior to the schedule date for opening of bids.
28
29 C. The Engineer will consider all such submittals and the Architect will issue an addendum
30 listing items which the Engineer considers acceptable. Only such items as specified or
31 approved as acceptable will be installed on this project.
32
33 D. Manufacturers' names are listed herein and on the plans to establish a standard of quality
34 and design. Where a manufacturer's name is mentioned, products of other manufacturers
35 will be acceptable, if in the opinion of the Engineer, the substitute material is of equivalent
36 quality or better than that of the material specified.
37
38 E. The Contractor's Bid represents that the bid price is based solely upon the materials and
39 equipment described in the Bid Documents (including addenda, if any) and that he
40 contemplates no substitutions or extras.
41
42 F. Requests for substitution are understood to mean that the Contractor:
43 1. Has personally investigated the proposed substitution and determined that it is equal
44 or superior in all respects to that specified.
45 2. Will provide the same guarantee for the substitution that he would for that specified.
46 3. Will, at no cost to the Owner, replace the substitute item with the specified product
47 if the substitute item fails to perform satisfactorily.

- 1
2 G. After Award of the Contract, substitutions will be considered only under one or more of
3 the following circumstances:
4 1. The substitution is required for compliance with subsequent interpretations of code
5 or insurance requirements.
6 2. The specified product is unavailable through no fault of the Contractor.
7 3. The manufacturer refuses to warranty the specified products as required.
8 4. Subsequent information that the specified product is unable to perform properly or
9 to fit in the designated space.
10 5. In the Engineer's sole judgment, the substitution would be in the Owner's best
11 interest.
- 12 H. Revisions to the plumbing system shall be under the supervision of the Engineer at a
13 standard hourly rate charged by the Engineer and shall be paid by the Contractor
14 originating the changes.
15

16
17 1.18 PROTECTION OF EQUIPMENT AND MATERIALS
18

- 19 A. The Contractor shall take such precautions as may be necessary to properly protect his
20 apparatus from damage.
21
- 22 B. This shall include the creation of all required temporary shelters to adequately protect any
23 apparatus above the floor of the construction and the covering of apparatus in the
24 completed building with tarpaulins or other protective covering.
25
- 26 C. Failure to comply with the above to the satisfaction of the Owner's inspector will be
27 sufficient cause for the rejection of the equipment in question and its complete
28 replacement by this Contractor.
29
- 30 D. All apparatus shall be cribbed up from the floor or ground by the Contractor and covered
31 with tarpaulins or other protective covering where necessary or directed.
32

33 1.19 FINAL INSPECTION
34

- 35 A. It shall be the duty of this Contractor to make a careful inspection trip of the entire
36 project, assuring himself that the work on the project is ready for final acceptance before
37 calling upon the Architect/Engineer to make a final inspection.
38
- 39 B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary
40 bonds, warranties, receipts, affidavits, etc., called for in the various articles of these
41 specifications, prepared and signed in advance, together with a letter of transmittal, listing
42 each paper included, and shall deliver the same to the Architect/Engineer at or before
43 the time of said final inspection. The Contractor is cautioned to check over each bond,
44 receipt, etc., before preparing for submission to verify that the terms check with the
45 requirements of the specifications.

1
2 1.20 CUTTING AND PATCHING
3

- 4 A. All Subcontractors shall notify the General Contractor sufficiently ahead of construction
5 of any floors, walls, ceiling, roof, etc., of any openings that will be required for his work.
6
7 B. He shall see that all sleeves required for his work are set at proper times so as to avoid
8 delay of the job.
9
10 C. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper
11 installation of the work under this Contract shall be done at the Subcontractor's expense
12 in a neat and workmanlike manner, and as approved by the Architect/Engineer.
13
14 D. No joists, beams, girders or columns shall be cut by any Contractor without first obtaining
15 written permission of the Architect/Engineer.
16
17 E. Patching of openings and/or alterations shall be provided by the General Contractor.
18
19 F. All openings in firewalls and floors, such as thimbles, shall be completely sealed after
20 installation for a completely airtight and watertight installation. Sealing material shall be
21 non-combustible and UL approved. The installed sealing assembly shall not cause the fire
22 rating of the penetrated structure to be decreased.
23
24 G. All openings in exterior walls shall be sealed watertight.

25
26 1.21 IDENTIFICATION
27

- 28 A. Refer to Section 22 05 54.
29

30 1.22 MANUFACTURER'S INSTRUCTIONS
31

- 32 A. All equipment and devices shall be installed in accordance with these plans and
33 specifications, manufacturer's instructions and applicable codes.
34
35 B. Where specifications call for installation of a product to be in accordance with
36 manufacturer's instructions and/or where manufacturer's instructions are required for
37 installation of a product, it shall be the Contractor's responsibility to obtain the necessary
38 applicable manufacturer's instructions and install the product in accordance with the
39 manufacturer's instructions.
40
41 C. It shall be the Contractor's responsibility to install all equipment, materials, and devices
42 shown on the plans and as called out in these specifications even if manufacturer's
43 instructions are absolutely unattainable.
44

1 1.23 RELATED WORK

- 2
- 3 A. The various specification sections for this division may or may not include related work
- 4 listings.
- 5
- 6 B. All related work shall be coordinated and provided by the Contractor regardless whether
- 7 specifically identified or not.
- 8

9 1.24 ELECTRICAL WIRING AND EQUIPMENT FOR PLUMBING SYSTEMS

- 10
- 11 A. All wiring, conduit, boxes, equipment (controls, thermostats, relays, contactors, motor
- 12 starters, heaters, switches) and any other control devices or equipment required to form
- 13 a complete and properly operating system, shall be the responsibility of this Contractor.
- 14
- 15 B. The Electrical Contractor shall only provide line voltage (including hook-up) to all
- 16 plumbing equipment.
- 17
- 18 C. All controls and devices shall be low voltage unless otherwise noted or shown on the
- 19 plans. Where line voltage controls or devices are noted, the Contractor shall provide
- 20 complete wiring diagrams (approved by the Engineer) to the Electrical Contractor prior
- 21 to final hook-up.
- 22
- 23 D. The Plumbing and Electrical plans are based on the equipment and devices scheduled as
- 24 shown on the plans or as called for in the specifications. Should any plumbing equipment
- 25 or device be changed or approved from those which are shown or noted, all electrical
- 26 and/or plumbing changes shall be made at the expense of the trade or Contractor
- 27 initiating the change with no expense to the Owner, Architect, Engineer or their
- 28 representatives.
- 29
- 30 E. All wiring provided by this Contractor shall be installed in a workmanlike manner using
- 31 tie wraps, labels, anchors and etc. Loose wiring is not acceptable.
- 32
- 33 F. All conduit and boxes required in all walls for control purposes (thermostats, switches,
- 34 etc.) shall be provided by electrical contractor.
- 35
- 36 G. All conduit required in attic, clear spaces, or on roof shall be by electrical Contractor.
- 37

38 1.25 OPERATION PRIOR TO COMPLETION

- 39
- 40 A. When any piece of plumbing equipment is operable and the Contractor needs to operate
- 41 the equipment, he may do so providing that he properly supervises the operation.
- 42
- 43 B. The warranty period shall, however, not commence until such time as the equipment is
- 44 operated for the beneficial use of the Owner.
- 45

1 C. Regardless of whether or not the equipment has or has not been operated, the Contractor
2 shall properly clean the equipment, install clean filter media, properly adjust and complete
3 all punch list items before final acceptance by the Owner.

4
5 D. The date of acceptance and the start of the warranty may not be the same date.
6

7 1.26 SAFETY GUARDS
8

9 A. Contractor shall furnish and install all safety guards required. All belt driven equipment,
10 projecting shafts and other rotating parts shall be enclosed or adequately guarded.
11

12 1.27 FLAME SPREAD PROPERTIES OF MATERIALS
13

14 A. All materials and adhesives used for plumbing and insulation shall conform to NFPA and
15 UL life and flame spread properties of materials.
16

17 B. The composite classifications shall not exceed 25 for a flame spread rating and 50 for a
18 smoke developed rating as listed for the basic material, the finishes, adhesives, etc.,
19 specified for each system and shall be such when completely assembled.
20

21 1.28 ASBESTOS
22

23 A. No asbestos or asbestos containing materials shall be permitted in this project.
24

25 1.29 LEAD MATERIALS
26

27 A. No lead or lead containing materials shall be allowed in any domestic or potable water
28 supply piping, valves, fixtures, components, equipment or any other item.
29

30 1.30 REFRIGERANTS
31

32 A. Chlorofluorocarbons (CFCs) shall not be allowed in any equipment on this project.
33

34 B. Comply with ASHRAE Standards 15 and 34.
35

36 1.31 REFRIGERANT RECOVERY AND RECYCLE
37

38 A. Refrigerants shall not be released to the environment.
39

40 B. Contractor shall provide recovery and recycle equipment that has been certified by the
41 Electrical Testing Laboratories or Underwriters Laboratories.
42

43 C. Contractor shall also provide properly trained and certified (in accordance with EPA)
44 personnel for refrigerant work during installation, demolition, start-up, servicing, etc.
45

1 1.32 ACCESS CLEARANCE

- 2
- 3 A. Proper access to all installed equipment shall be provided. This Contractor shall label all
- 4 points of access immediately upon installation with a marker pen.
- 5
- 6 B. A minimum of 3 feet shall be maintained in front of all access points.
- 7
- 8 C. If another trade violates this space, this Contractor shall immediately notify the General
- 9 Contractor to correct this condition.
- 10
- 11 D. When equipment is installed above lay-in ceiling this Contractor shall coordinate with the
- 12 Ceiling Contractor to provide access without removing part of T-bar ceiling.
- 13
- 14 E. No speakers, lights, fire alarm equipment, etc. shall be installed in lay-in ceiling tiles where
- 15 access is to be gained.
- 16

17

18 PART 2 PRODUCTS

- 19
- 20 A. Not Applicable
- 21

22

23 PART 3 EXECUTION

24

25 3.1 TESTING

- 26
- 27 A. After all plumbing systems have been completed and put into operation, subject each
- 28 system to an operating test under design conditions to ensure proper sequence and
- 29 operation throughout the range of operation regardless of the season the Contractor shall
- 30 test all plumbing equipment.
- 31
- 32 B. Perform a smoke test on all sanitary sewers and camera all lines and provide owner with
- 33 a video tape.
- 34
- 35 C. Perform gas piping pressure test to comply with HB 1611 and all required City or
- 36 governing body tests.
- 37
- 38 D. Make adjustments as required to ensure proper functioning of all systems.
- 39
- 40 E. Special tests on individual systems are specified under individual sections.
- 41

42 3.2 AS BUILT DRAWINGS

- 43
- 44 A. Upon substantial completion, Contractor shall submit as built drawings showing all
- 45 deviations between contract drawings and actual installed conditions.
- 46

1
2
3

B. Show location of all valves in gas and water piping. Submit to Owner.

END OF SECTION

SECTION 22 00 90

PLUMBING SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. This section supplements Division 01 Submittal Procedures and contains additional requirements applicable to Division 22 submittals.

1.2 SECTION INCLUDES

- A. This section includes, but is not limited to:
 - 1. Plumbing submittal procedures
 - 2. List of required Division 22 submittals to the engineer
 - 3. This section applies only to the Division 22 specifications. Submittals required by other specification divisions are not included here, even though the same subcontractor may be providing work under other divisions.

1.3 RELATED SECTION

- A. Division 01 – Submittal Procedures

1.4 DEFINITIONS

- A. Product Data: Illustrations, standard schedules, performance charts, instructions, and brochures furnished by the contractor, subcontractor, manufacturer, or supplier to illustrate materials or equipment or to illustrate some portion of the work. Provide a summary of scheduled items with all data in schedules.
- B. Shop Drawings: Drawings, diagrams, schedules and other data specifically prepared for the work by the contractor, subcontractor, manufacturer, or supplier to illustrate some portion of the work.
- C. Equipment/Material Submittal Package: A compilation of the product data, shop drawings, and other items as required by the specifications, submitted near the start of the work. Typically, the specifications require the initial submittal package to be submitted within a certain number of days after the work starts.
- D. Quality Assurance Submittal: Items submitted before and during the execution of a particular portion of the work for the purpose of guarding against defects and deficiencies.

1 E. Quality Control Submittal: Items submitted at the completion of a particular portion of
2 the work for the purpose of evaluating completed activities and elements of the work for
3 conformance with contract requirements (e.g. start-up reports).

4
5 F. Closeout Submittals: Items submitted at or near the completion of the contract.
6

7 1.5 SUBMITTALS
8

9 A. The materials, workmanship, design, and arrangement of all work installed under this
10 contract shall be subject to the review of the architect, engineer and owner.

11
12 B. Manufacturers: Manufacturers submitted shall be as per the acceptable manufacturers
13 listed in each specification section or referenced schedule. For additional manufacturers
14 requiring approval, reference the Substitution of Products article in Section 22 00 10.
15

16 C. Required Submittals: Refer to the Submittals article of each individual Division 22
17 specification section for the required items to be submitted.
18

19 D. Contractor's Coordination Submittals: The contractor may require his subcontractors to
20 provide drawings, setting diagrams, and similar information to help coordinate the
21 project, but such data shall remain between the contractor and his subcontractors and
22 will not be reviewed by the engineer.
23

24 E. Electronic Submittals: Fax, e-mail, or other electronic forms of submittals from the
25 contractor are not acceptable unless contractor has prior approval of Architect and
26 Engineer. With the prior approval of the architect and the engineer, the contractor may
27 request that the review comments of the engineer be returned in electronic form. If this
28 method is agreed upon, then the procedures described in this section shall be modified
29 as follows:

- 30 1. The contractor shall supply only one copy of the submittal, rather than the six copies
31 described in this section. The submittal shall be accompanied by a letter stating that
32 the contractor desires the response in electronic form, and that prior approval for
33 this method has been granted.
- 34 2. After reviewing the submittal, the engineer will create electronic files from the
35 reviewed submittal material.
- 36 3. The electronic files will either be mailed to the architect, or posted to a web site,
37 depending on the architect's requirements. The architect and contractor can
38 distribute copies of the files as desired. Electronic submittal shall be submitted as
39 one file in PDF format.
- 40 4. The engineer will retain the paper copy of the submittal as a file copy.
41

42 F. Coordination Correspondence: The contractor may desire to verify the acceptability of a
43 particular item prior to assembling the initial submittal package. The contractor may send
44 material directly to the engineer for comments and feedback. This communication,
45 whether by mail, fax, or e-mail, will be treated as normal coordination correspondence
46 and will not be tracked or documented as a formal submittal. The engineer may or may
47 not respond to such correspondence. If the engineer agrees, in writing, to the use of a

1 particular item, then that same material shall be included in the initial submittal package
2 along with a copy of the correspondence.
3

4 G. Unapproved Products: If materials or equipment are installed before being reviewed and
5 approved by the engineer, the contractor shall be liable for the removal and replacement
6 of such unapproved materials and equipment, at no additional expense to the owner.
7 Additionally, if the removal and replacement of unapproved materials or equipment
8 necessitates the removal and replacement of other related materials or equipment, then
9 the contractor shall be liable for the removal and replacement of the related materials and
10 equipment at no additional expense to the owner.
11

12 H. Product Data:

13 1. Where the content of manufacturer submittal literature includes data not pertinent
14 to the submittal, clearly indicate which portions of the contents are being submitted
15 for review. Catalogs, pamphlets, or other documents submitted to describe items on
16 which review is being requested shall be specific and identifications in catalog,
17 pamphlets, etc., of items submitted shall be clearly made in a contrasting ink or
18 highlighting. Data of a general nature shall not be acceptable.
19

20 I. Shop Drawings:

21 1. Scale and measurements: Make shop drawings accurately to a scale sufficiently large
22 to show all pertinent aspects of the item.
23 2. Types of prints required: Submit shop drawings in blue-line or black-line prints,
24 minimum of six (6) sets blue-line or black-line prints of each sheet.
25

26 1.6 QUALITY ASSURANCE / CONTROL SUBMITTALS 27

28 A. Quality assurance and quality control submittals may be in the form of documentation,
29 or may be in the form of completed physical work that is offered for review by the
30 engineer, architect, or owner.
31

32 B. If documentation is the subject, then submit in a manner similar to the initial submittal
33 package.
34

35 C. If completed physical work is the subject, then the work shall not be concealed, nor shall
36 subsequent work be performed, until the engineer's representative has reviewed the work.
37 If the work is concealed, or if subsequent work is performed, before the engineer's
38 representative has reviewed the work, then the contractor shall be liable for removal and
39 replacement at no additional expense to the owner.
40

41 D. Sequencing:

42 1. Within 30 calendar days after the contractor has received the owner's notice to
43 proceed, provide the complete submittal package.
44 2. After the engineer has reviewed the submittal package, make necessary revisions to
45 the submittals as directed by the engineer and resubmit.
46 3. After the submittal has been reviewed by the engineer, proceed to purchase materials
47 and perform the work.

1
2 E. Scheduling:

- 3 1. Failure to submit items that meet the requirements of the contract documents in
4 ample time for review shall not entitle the contractor to an extension of contract
5 time, and no claim for extension by reason of such default shall be allowed. The
6 contractor may be held liable for delays so occasioned.
7

8
9 PART 2 PRODUCTS

- 10
11 A. Not applicable
12

13
14 PART 3 EXECUTION

15
16 3.1 SUBMITTALS

- 17
18 A. Make submittals of product data, shop drawings, samples, quality assurance submittals,
19 quality control submittals, and other items in accordance with the requirements of this
20 section, applicable sections in Division 22, and additional requirements of each individual
21 Division 22 specification section.
22

23 B. Grouping of Submittals:

- 24 1. The submittal package shall be coordinated and included in a single submission.
25 Multiple submissions are not acceptable except where prior written approval has
26 been obtained from the engineer. Partial submittals may be rejected, without being
27 reviewed, as not complying with the provisions of the contract.
28

29 C. Submittal Organization:

- 30 1. Provide a submittal cover sheet that lists at least the following:
31 a. Project name
32 b. Date
33 c. Name and address of architect
34 d. Name and address of engineer
35 e. Name, address and telephone number of prime contractor
36 f. Name, address and telephone number of plumbing contractor
37 g. Name, address and telephone number of plumbing supplier
38 2. The second and third sheet shall be blank for stamping of submittals.
39 3. Provide an index sheet listing all items submitted.
40 4. The contractor shall call to the attention of the engineer by letter, included in the
41 submittal after the index sheet, any instance in which the submittals are known to
42 differ from the requirements of the contract documents.
43 5. Organize all required items by specification section. The material for each
44 specification section shall be organized as follows:
45 a. Provide a tabbed index divider with the specification number and title.

- b. Provide a section cover sheet that lists the same information as the submittal cover sheet, plus the specification number and title and the name, address and telephone number of the vendor or vendor's representative, if applicable.
- c. Refer to the individual Division 22 specification sections for any required organization of the submittal material within each tabbed submittal section.
- d. Tabbed sections shall be arranged by specification section number in numerical order.
- e. Organize all required data in a 3-ring hard cover binder suitable for filing. Soft binders are not acceptable.
- f. Provide a minimum of six copies, each in a separate binder.
- g. Submit in accordance with the procedures described in Division 01 Submittal Procedures.
- h. Submittals not organized as described here may be rejected, without being reviewed, as not complying with the provisions of the contract.

D. Response to engineer's review:

1. Review comments:

- a. Review comments of the engineer will either be shown on the returned sets to the contractor, or shown on a document attached to the sets. If the comments are on an attached document, then the engineer will place a note on the submittal referring to the attached comments. In such cases, the engineer's signature will appear only on the attached document. If the attached, signed document becomes physically separated from the submittal, then the submittal will no longer be considered as being a reviewed submittal.

2. Complete rejection:

- a. If the submittal is not complete or does not meet the requirements of this specification section, then the engineer may reject the entire submittal and return the submittal without further review or comment. In such cases, the entire submittal shall be completely revised and resubmitted. The resubmittal shall be given a new submittal number and shall be documented and processed as a separate submittal from the original.

3. Held for completion:

- a. If the submittal is not complete, but is only missing some minor item, the engineer may, at the engineer's sole discretion, hold the submittal rather than rejecting and returning the submittal. In such cases, the engineer will notify the architect and contractor that the submittal is being held for completion. The contractor will be given a predetermined amount of time to provide the missing item. Upon receipt of the missing item, the engineer will insert the missing item into the submittal package and proceed with the review process.

4. Partial rejection:

- a. The engineer may reject only certain portions of the submittal. In such cases, only those rejected portions or items need to be revised and resubmitted.

5. Provide as corrected:

- a. The engineer may note a required change to a submitted item, but may not consider the change serious enough to require a resubmittal. In such cases, the engineer will note that the item is to be provided as noted or corrected. In such cases, the contractor may proceed to provide the item. However, if subsequent

1 observations reveal that the noted change was not made, then the contractor
2 shall be liable for removal and replacement of the item at no additional cost to
3 the owner.

4 6. Reviewed without comment:

- 5 a. The contractor may proceed to provide all materials and equipment.
6

7 E. Quality Assurance / Quality Control Submittals:

- 8 1. Provide quality assurance and quality control submittals at those points in the
9 progress of the work in accordance with the requirements of individual Division 22
10 specification sections.

- 11 2. If the subject of the submittal is completed physical work, then submit the work for
12 review by notifying the engineer's representative in sufficient time to schedule the
13 site visit. The engineer's representative will document the review in an observation
14 report. Make noted corrections to the work and resubmit the work for review before
15 covering the work or proceeding with subsequent work.
16

17 F. Close-out Submittals:

- 18 1. Provide close-out submittals in accordance with the requirements of Division 1.
19

20 G. The checklist is on the following page.

Submittal Checklist – Plumbing

Grouping of submittals is by written permission only. Listed items shall be organized and bound in a 3-ring binder in accordance with the specifications. Incomplete or unbound submittals will be rejected.

Required Plumbing submittals in the initial submittal package include but are not limited to the following. Always refer to the individual specification sections.

Specification Reference		Description
<input type="checkbox"/>	22 00 10 <input type="checkbox"/> Basic Plumbing Requirements	
<input type="checkbox"/>	22 05 24 <input type="checkbox"/> Valves - General	<input type="checkbox"/> Valves
<input type="checkbox"/>	22 05 30 <input type="checkbox"/> Pipe & Pipe Fittings - General	<input type="checkbox"/> Di-electric unions <input type="checkbox"/> Escutcheons <input type="checkbox"/> Pipe supports
<input type="checkbox"/>	22 05 34 <input type="checkbox"/> Isolation Devices	<input type="checkbox"/> Isolation Devices
<input type="checkbox"/>	22 05 54 <input type="checkbox"/> Plumbing Identification	<input type="checkbox"/> Equipment labels <input type="checkbox"/> Piping and control diagram signs <input type="checkbox"/> Pipe markers <input type="checkbox"/> Valve tags <input type="checkbox"/> Underground warning tape
<input type="checkbox"/>	22 07 20 <input type="checkbox"/> Piping Insulation	<input type="checkbox"/> Pipe insulation
<input type="checkbox"/>	22 11 17 <input type="checkbox"/> Domestic Water Piping & Appurtenances	<input type="checkbox"/> Domestic water piping <input type="checkbox"/> Valves <input type="checkbox"/> Water hammer arrestors
<input type="checkbox"/>	22 13 17 <input type="checkbox"/> Soil, Waste & Sanitary Drain Piping & Appurtenances	<input type="checkbox"/> Drain pipe & fittings <input type="checkbox"/> Clean outs <input type="checkbox"/> Trap primers
<input type="checkbox"/>	22 13 18 <input type="checkbox"/> Condensate Piping	<input type="checkbox"/> Condensate piping
<input type="checkbox"/>	22 33 34 <input type="checkbox"/> Access Doors	<input type="checkbox"/> Access doors
<input type="checkbox"/>	22 40 01 <input type="checkbox"/> Plumbing Fixtures & Fixture Carriers	<input type="checkbox"/> Water heaters <input type="checkbox"/> Expansion tanks <input type="checkbox"/> Circulating pumps <input type="checkbox"/> Water hammer arrestors <input type="checkbox"/> ADA Accessories <input type="checkbox"/> Science Room Solenoid valves <input type="checkbox"/> Water closet <input type="checkbox"/> Urinals <input type="checkbox"/> Lavatories <input type="checkbox"/> Carriers <input type="checkbox"/> Faucets <input type="checkbox"/> Sinks <input type="checkbox"/> Electric water coolers <input type="checkbox"/> Mop sinks <input type="checkbox"/> Showers <input type="checkbox"/> Wash fountains <input type="checkbox"/> Floor drains <input type="checkbox"/> Flush valves <input type="checkbox"/> Thermostatic mixing valves

END OF SECTION

1 SECTION 22 05 24

2 VALVES - GENERAL

3
4
5
6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

12
13 1.2 SECTION INCLUDES

- 14
15 A. General requirements for valves

16
17 1.3 RELATED SECTIONS

- 18
19 A. Section 22 00 10 - Basic Plumbing Requirements
20
21 B. Section 22 05 30 - Pipe and Pipe Fittings - General
22
23 C. Section 22 11 17 - Domestic Water Piping and Appurtenances

24
25 1.4 REFERENCES

26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44

ASTM 61	Standard Specification For Steam or Valve Bronze Castings
ASTM C27450	Standard Specification For Brass Rod, Bar & Shapes
ASTM A126	Standard Specification For Gray Iron Castings For Valves, Flanges & Pipe Fittings
ASTM A105	Standard Specification For Carbon Steel Forgings For Piping Applications
ASTM	American Society of Testing Materials
ASTM A216	Standard Specification For Steel Castings, Carbon, Suitable For Fusion Welding, For High Temperature Service
ASTM B813-00e1	Standard Specification for Liquid & Paste Fluxes for Soldering of Copper & Copper Alloy Tube
ASTM B828-02	Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
ASTM B88-02	Standard Specification for Seamless Copper Water Tube
ASTM B62	Standard Specification For Composition Bronze or Ounce Metal Castings
PDI	Plumbing & Drainage Institute

1 1.5 QUALITY ASSURANCE

- 2
3 A. Manufacturer to stamp valve to show that shell and seat tests have been successfully
4 completed.

5
6 1.6 SUBMITTALS

- 7
8 A. Provide submittal data on all items specified in this section in accordance with
9 Specification Section 22 00 10, General Conditions, and Division 01.

10
11
12 PART 2 PRODUCTS

13
14 2.1 MATERIAL SPECIFICATIONS

- 15
16 A. Bronze - 150 psi maximum: ASTM B62
17
18 B. Bronze - 300 psi maximum: ASTM B61
19
20 C. Cast Iron: ASTM A126, Class B
21
22 D. Cast Carbon Steel: ASTM A216, Grade WCB
23
24 E. Forged Carbon Steel: ASTM A105, Grade II
25
26 F. Brass is not acceptable; unless lead free brass with CW511L alloy; ASTM C27450

27
28 2.2 CONSTRUCTION

- 29
30 A. Provide valves designed for repacking under pressure when fully opened.
31
32 B. Equip with packing suitable for intended service.
33
34 C. Furnish with gland followers.
35
36 D. Provide valves rated greater than the design temperature and pressure for the intended
37 system.
38
39 E. All domestic cold water and hot water valves 2" and less shall be full port ball valves.

40
41
42 PART 3 EXECUTION

43
44 3.1 INSTALLATION

- 45
46 A. Install valves and stops in accessible locations.
47

1 B. Provide where shown or as required to make system complete and readily maintained.

2

3 C. Provide access doors for all inaccessible valves.

4

5 D. Provide as built drawings locating all valves in gas and water lines.

6

7

END OF SECTION

SECTION 22 05 30

PIPE AND PIPE FITTINGS - GENERAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Pipe
- B. Pipe fittings

1.3 RELATED SECTIONS

- A. Section 22 00 10 - Basic Plumbing Requirements
- B. Section 22 05 24 - Valves - General
- C. Section 22 07 20 - Piping Insulation
- D. Section 22 11 17 - Domestic Water Piping and Appurtenances
- E. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances
- F. Section 22 13 18 - Condensate Piping
- G. Section 22 14 01 - Roof Drainage Piping and Appurtenances
- H. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers

1.4 REFERENCES

- | | |
|----------------|---|
| ASME | American Society of Mechanical Engineers |
| ASTM C564-97 | Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings |
| ASTM D2665-02a | Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings |
| ASTM E84-01 | Standard Test Method for Surface Burning Characteristics of Building Materials |

1 UL Underwriters Laboratory
2 NFPA 90 A & B Installation of Air Conditioning & Ventilation Systems and Installation
3 of Warm Air Heating and Air Conditioning Systems
4 CISPI-310 Cast Iron Soil Pipe Institute
5

6 1.5 QUALITY ASSURANCE
7

8 A. Valves:

9 1. All valves to be from a single manufacturer.
10

11 B. The welder, employed on this project, shall have passed qualification tests as prescribed
12 by the National Pipe Welding Bureau, or other reputable testing laboratory using
13 qualification procedures as recommended by the ASME Boiler Construction Code or the
14 American Welding Society Standards.
15

16 1.6 SUBMITTALS
17

18 A. Provide submittal data on all items specified in this section in accordance with
19 Specification Section 22 00 10, General Conditions, and Division 01.
20

21 B. Submit product data indicating dimensions, general assembly and use.
22
23

24 PART 2 PRODUCTS
25

26 2.1 PIPE AND FITTINGS
27

28 A. The type of pipe and fittings necessary for each system is specified in the section on that
29 system.
30

31 2.2 DISSIMILAR MATERIALS
32

33 A. Use approved adapters such as Di-Electric Unions manufactured for making piping
34 connections between dissimilar materials such as copper and brass or copper and steel.
35

36 2.3 ESCUTCHEONS
37

38 A. Usage:

39 1. All exposed lines passing through floors, walls and ceilings.
40

41 B. Material:

42 1. Chrome plated steel
43

44 C. Flange size:

45 1. As necessary to cover penetrated openings.
46

- 1 D. Plate size:
2 1. As necessary to fit pipe or insulation and securely lock in place.
3

- 4 E. Manufacturer/Model:
5 1. Engineered Brass Company, Type CF
6

7 2.4 SLEEVES
8

- 9 A. Application:
10 1. Provide sleeves for all pipes and conduits which pass through a concrete slab,
11 masonry wall/concrete wall, roof or other portion of the building structure.
12

- 13 B. Above Grade and/or dry locations:
14 1. Material:
15 a. 20 or 22 gauge galvanized steel.
16 2. Size:
17 a. As necessary to allow free passage of the insulated pipe.
18

- 19 C. Below Grade and/or moist locations:
20 1. Material:
21 a. ASTM D-2665 Schedule 40 PVC. When PVC not allowed by code, use schedule
22 40 galvanized steel.
23 b. Return Air Plenum:
24 (1) Schedule 40 galvanized steel.
25

- 26 D. Passing through fire-rated enclosures:
27 1. Material:
28 a. Galvanized or black steel pipe.
29 b. Non-combustible.
30 c. PVC will not be allowed.
31

- 32 E. Penetration Seal:
33 1. Seal penetration with Fiberfrax Fyre putty or one-component ceramic fiber-based
34 putty fill, void or cavity material, UL rated material classified for use in through-
35 penetration firestop systems nos. 124, 125, 150 and 151.
36 2. Flame Spread/Smoke Contribution:
37 a. 0/0 in accordance with ASTM E-84.
38

39 2.5 VALVES, UNIONS, STOP COCKS, ETC.
40

- 41 A. Applications:
42 1. Ball Valves:
43 a. Provide accessible valves at each group of plumbing fixtures and at each piece
44 of equipment on all piping systems for isolation of fixtures and equipment. All
45 valves shall be full port valves.
46

- 1 B. All Other Valves, Unions, Stop Cocks, Etc.:
- 2 1. Provide at each group of plumbing fixtures and at each individual fixture, at each
- 3 piece of equipment, at all inlet and outlet connections for hot and cold water and
- 4 gas.
- 5 2. Provide Di-Electric Unions at connection of dissimilar pipe materials to prevent
- 6 electrolysis.
- 7
- 8 C. Type:
- 9 1. Suitable for 125 lbs. working pressure.

10

11 2.6 PIPE SUPPORTS

12

- 13 A. Hangers:
- 14 1. 2" and Smaller Piping:
- 15 a. May be split cast ring type with fastening device in walls and chases.
- 16 2. Copper Piping:
- 17 a. Copper plated ferrous hangers.
- 18 3. All Other Above Ceiling Locations:
- 19 a. Adjustable clevis type. Hangers to accommodate circumference of pipe and
- 20 saddles.
- 21
- 22 B. Hanger Rods:
- 23 1. Type:
- 24 a. Minimum 3/8 inch diameter with machine threads.
- 25
- 26 C. Minimum Steel Hanger Rod Diameter for Individually Suspended Horizontal Pipes:
- 27 1. 2" and smaller diameter pipe:
- 28 a. 3/8"
- 29 2. 2-1/2" to 3 - 1/2" diameter pipe:
- 30 a. 1/2"
- 31 3. 4" to 5" diameter pipe:
- 32 a. 5/8"
- 33 4. 6" diameter pipe or larger:
- 34 a. 3/4"
- 35
- 36 D. Hanger Manufacturers:
- 37 1. Anvil
- 38 2. Elcen
- 39 3. ERICO
- 40 4. F&S Manufacturing
- 41 5. Fee & Mason
- 42 6. PHD
- 43
- 44 E. In wall pipe supports:
- 45 1. Metal strut, manufactured pipe clamps
- 46

- 1 F. In wall pipe support manufacturers:
2 1. Holdrite or Equivalent
3

4
5 PART 3 EXECUTION
6

7 3.1 PIPE INSTALLATION
8

- 9 A. Install piping in a neat and workmanlike manner.
10
11 B. Install each of the piping systems to provide for expansion and contraction.
12
13 C. Solder all joints when the system is not under strain.
14
15 D. Expansion Offsets:
16 1. Copper Piping:
17 a. Use developed length Copper Tube Handbook 411-R as published by Copper
18 Development Association, Inc.
19 2. Steel Piping:
20 a. Use developed per Carrier System Design Manual, Part 3 Piping Design.
21
22 E. Furnish necessary spring pieces and offsets as required.
23
24 F. Conceal all of the piping systems in chases, above ceilings, in walls and in finished areas.
25
26 G. Run Exposed piping only in machinery spaces and unfinished areas as specified or as
27 shown on the plans.
28
29 H. Install all necessary fittings and offsets to hold the piping close to walls and ceilings.
30
31 I. Where these lines run exposed, obtain a clearance from the Engineer in writing before
32 making the installation.
33
34 J. Install piping in the most advantageous manner possible with respect to headroom, valve
35 access, openings, equipment clearances, and clearances for other work.
36
37 K. Give particular attention to piping in the vicinity of equipment.
38
39 L. Preserve the maximum access to various equipment parts for maintenance.
40
41 M. Do not cut or weaken any structural member.
42
43 N. Cut all pipes accurately to measurement determined at the site.
44
45 O. After cutting pipe, ream it to remove burrs.
46

- 1 P. Install piping neatly, free from unnecessary traps and pockets. Work into place without
2 springing or forcing.
3 Q. Use fittings to make all changes in direction.
4
5 R. Field bending and mitering are prohibited.
6
7 S. Make all connections to equipment using flanged joints or unions.
8
9 T. Make reducing connections with reducing fittings only.
10
11 U. Do not allow piping to pass through or over designated electrical rooms.
12

13 V. Compression fittings are not allowed.
14

15 3.2 VALVES, UNIONS, STOP COCKS, ETC. 16

- 17 A. Locate all valves so that their bonnets may be easily removed.
18
19 B. Move all flange valves shown in horizontal positions so that valve stem is inclined one
20 bolt hole above the horizontal position.
21
22 C. Make-up all screwed pattern valves placed in horizontal lines so that their valve stem is
23 inclined at an angle of 30 degrees above the horizontal position.
24
25 D. All valve stems must be true and straight at the time the system is tested for final
26 acceptance.
27
28 E. Pack all valves and leave perfectly tight at the completion of the work.
29
30 F. Provide access doors as required for these valves.
31
32 G. Furnish locations of all access doors to the Architect/Engineer.
33

34 3.3 PIPING JOINTS 35

- 36 A. Screwed Pipe Joints:
37 1. Provide full cut pipe threads.
38 2. Assemble joints with an approved compound applied to only the male threads.
39 3. Leave a maximum of three pipe threads exposed where the joint is assembled.
40
41 B. Welded Pipe Joints:
42 1. Fuse weld by using a metallic arc welding process.
43 2. Conform to the current recommendations of the American Welding Society for all
44 welding operations.
45

1 C. Mechanical Coupling Joints:

- 2 1. Assemble in strict accordance with the recommendations of the coupling joint
3 manufacturer.
4 2. Use bolts, fasteners, gaskets and lubricants that are a product of or adhere rigidly to
5 the specification requirements of the joint manufacturer.
6

7 D. Solder Joints:

- 8 1. Assemble with square cut pipe using a pipe cutter.
9 2. Hacksaw-cut pipe ends will not be acceptable.
10 3. Ream open pipe end to full size.
11 4. Burnish both the pipe and fitting absolutely clean.
12 5. Apply brazing flux to both the pipe and the fittings.
13 6. The use of corrosive acid flux will not be permitted.
14 7. Charge the pipe and fittings with nitrogen gas during the brazing.
15

16 E. PVC Pipe Joints:

- 17 1. May be solvent cemented using the proper cement recommended for the particular
18 materials.
19 2. Cut all pipe square and clean both pipe and fittings of all soil, dirt, oil and grease.
20 3. Make solvent joints in accordance with the applicable ASTM Standards.
21 4. Allow joints to dry before testing.
22 5. If any leak occurs during the water test, then replace the defective joint.
23 6. Comply with requirements of the NSF Standard 14 for all solvent cements and
24 primers and label to identify the laboratory certifying compliance for the particular
25 cement and primer being used.
26 7. Plastic pipe and fittings for sewer and water pressure lines may also be joined by use
27 of elastomeric (O-ring gasket) joints when the respective standards for the materials
28 so specify. No-Hub fittings are not allowed on PVC sanitary sewer and storm drain
29 piping under slab or underground.
30 8. Do not use pipes with cracked bells.
31

32 3.4 SLEEVES

33
34 A. Above Grade and/or Dry Locations:

- 35 1. Walls:
36 a. Mount flush on both sides.
37 2. Floors:
38 a. Mount 2 inches above finished floor in pipe chases.
39

40 B. Below Grade and/or Moist Locations:

- 41 1. Install suitable flange in the center of wall or floor to form a waterproof passage.
42 2. Fill the void space around the pipe with jute twine or Oakum caulk or an asphalt
43 based compound to insure a waterproof penetration.
44

45 C. Passing Through Fire-Rated Enclosure:

- 46 1. Fill the void space around the pipe in accordance with NFPA requirements.
47 2. Do not allow the sleeve installation to lower the fire rating of the assembly.

1
2 3.5 SECURING AND SUPPORTING OF PIPE
3

- 4 A. Support all pipe from the building structure by means of approved hangers and supports
5 while maintaining required grade and pitch, preventing vibration and providing for
6 expansion and contraction.
7
- 8 B. Secure all hangers to approved inserts wherever possible.
9
- 10 C. Set hanger inserts in place when the concrete is poured.
11
- 12 D. If Joists Are Used for Attachment:
13 1. 2" diameter or smaller:
14 a. May be attached to the bottom of joists.
15 2. Greater than 2" diameter:
16 a. Must be attached to the top cord of the joists.
17 3. Do not support any piping and trapeze hangers from joist bridging on roof and floor
18 deck.
19
- 20 E. If Structural Steel Framing Is Used for Attachment:
21 1. Use approved beam clamps.
22 2. Where required, install channels to span between framing members.
23 3. Do not attach hangers to the roof deck or cross bracing.
24
- 25 F. Hanger Spacing:
26 1. Schedule 40 PVC Piping:
27 a. All Sizes:
28 (1) 4'-0"
29
- 30 G. Ferrous (Schedule 40) Piping:
31 1. 1/2" diameter pipe:
32 a. 6'-0" or less
33 2. 3/4" diameter pipe:
34 a. 8'-0" or less
35 3. 1-1/4" diameter pipe:
36 a. 10'-0" or less
37 4. Vertical:
38 a. Every Floor Level Minimum
39
- 40 H. Copper (Water Tube) Piping:
41 1. Smaller Than 1 1/4":
42 a. 6'-0"
43 2. 1 1/2" and Larger:
44 a. 10'-0"
45 3. Vertical:
46 a. 10'-0"
47

1 I. Vertical Lines:

- 2 1. Adequately support at their bases, either by a suitable hanger placed in the horizontal
3 line near the riser, or by a base fitting set on a pedestal or foundation.
4 2. Support from each floor slab by means of an approved clamp-type support which
5 bears on the slab or beam.
6

7 J. Change of Direction:

- 8 1. Install supports within two feet of change of direction.
9 2. Brackets of approved type may be used along the walls.
10 3. Install hangers within 2 feet of each change in vertical or horizontal direction, pipe
11 tees and on each side of valves, strainers, etc.
12 4. Multiple horizontal pipes, smaller than 12" diameter pipe, may be supported on
13 trapeze hangers. Space trapeze hangers in accordance with the schedule for pipe
14 spacing based upon the smallest size pipe.
15 5. Properly size the trapeze members for the piping load they are to support. The
16 number of pipes on the trapeze must be approved by the Engineer to prevent
17 overloading of the building structure.
18 6. Where pipes are insulated, oversize the hanger accordingly to accommodate the
19 outside diameter of the insulation. Provide half-round 16 gauge galvanized steel
20 shields, not less than 12" long and rolled to fit the insulation diameter, between the
21 insulation and the hanger.
22 7. When pipe is guided at top and bottom, cover the entire pipe circumference with
23 metal shields.
24 8. Adhere metal shield to the insulation so that the metal will not slide with respect to
25 the insulation.
26 9. Wood struts shall not be used to support piping in walls.
27

28 3.6 EXCAVATION AND BACKFILLING

29 A. Excavation:

- 30 1. Call utility companies before digging.
31 2. Call Notifications Center before digging.
32 3. Excavate trenches for underground piping to the required depths with bell holes
33 being provided as necessary to insure uniform bearing. Dig all bell holes after the
34 trench has been graded.
35 4. Refill excavation below the required grade of piping with fine granular material to
36 the pipe grade.
37 5. Where rock is encountered, excavate to a grade 3 inches below the lowermost part
38 of the pipe and refill with fine granular materials to the pipe grade.
39 6. Sheath, brace, pump or bail the trenches as required to protect workmen and
40 structures and to permit execution of the work. A trench greater than 5 feet deep will
41 not be permitted unless the sides are cutback at 45 degrees to 5 feet or less. If this
42 cannot be accomplished, hire a Registered Engineer to design shoring.
43 7. Install all underground piping below the frost line and in no case less than 18 inches
44 below the surface.
45
46

- 1 B. Backfilling:
2 1. Do not backfill until after all required tests have been performed and approved.
3 2. Perform all backfilling with approved materials well compacted in place in
4 accordance with the General Specifications including Division 02.
5
6 C. Rigid Pipe (Ductile Iron):
7 1. Backfill with select materials of the proper moisture content to obtain a support
8 under the lower half of the pipe.
9 2. Compact to a density of 90% AASHTO T-180 modified or better.
10
11 D. Non-Rigid Pipe (PVC):
12 1. Backfill as specified for rigid pipe except backfill the entire trench surrounding the
13 pipe barrel to a point 12 inches above the top of the pipe with select material
14 compacted to a density of 90% AASHTO T-180 modified or better.
15 2. Lay backfill according to manufacturer's recommendations.
16
17 E. Job Photographs:
18 1. Contractor is to provide digital photographs of all pipe showing sand embedment
19 prior to covering trenches.
20

21 3.7 EQUIPMENT PLUMBING CONNECTIONS
22

- 23 A. Make all final connections to all pieces of equipment which require natural gas, water,
24 drain, waste or vent connections.
25
26 B. Provide all required shut-off cocks, valves, drain valves and traps.
27

28 3.8 TESTING AND INSPECTION
29

- 30 A. Perform all tests as specified in Division 22 or as required by the Engineer or by the Local,
31 Federal, and State Bureaus having jurisdiction and under their supervision during the
32 progress and upon completion of work.
33
34 B. Include costs of all required tests in your bid.
35
36 C. Provide all apparatus, temporary pipeline and all other requirements necessary for such
37 tests.
38
39 D. Take all due precautions to prevent damage to the building or its contents incurred by
40 such tests as the Contractor will be required to repay and make good any damage so
41 caused at his own expense.
42
43 E. Immediately repair any leaks, defects or deficiencies discovered as a result of the tests.
44 Repeat until test requirements are in full compliance.
45

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3.9 IDENTIFICATION OF PIPING AND EQUIPMENT

- A. Mark all piping to show the service and direction of flow.
- B. Place markers at each branch of tees, at equipment connections, and change of direction and at 20 foot intervals. Minimum of one (1) marker in each room.
- C. Install valve tags on all valves.
- D. Frame under glass cover and hang a type written list including the valve number, type of service, and location of each valve in the boiler mechanical room.
- E. Mark all valve numbers corresponding to this system of identification on the as-built drawings which will be delivered to the Owner upon completion of the work.

END OF SECTION

1 SECTION 22 05 54

2
3 PLUMBING IDENTIFICATION

4
5
6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

12
13 1.2 SECTION INCLUDES

- 14
15 A. Identification required for plumbing systems.
16
17 B. Code required identification not shown on plans nor specified herein shall be provided.

18
19 1.3 RELATED SECTIONS

- 20
21 A. Section 22 00 10 - Basic Plumbing Requirements
22
23 B. Section 22 05 30 - Pipe and Pipe Fittings - General

24
25 1.4 SUBMITTALS

- 26
27 A. Provide submittal data on all items specified in this section in accordance with
28 Specification Section 22 00 10, General Conditions, and Division 01.
29
30 B. Submit wording of nameplates with submittals.
31
32 C. Submit list of all products incorporated in this section.

33
34 1.5 REFERENCES

- 35
36 A. Comply with ANSI A13.1
37
38 B. USAS Code B31.8
39
40 C. NTSB-PSS-73-1
41
42 D. AGA
43
44 E. API

- 1 1.6 DESCRIPTION OF WORK
2
3 A. Provide signs for the following equipment identification:
4 1. Water Heaters
5 2. Piping
6 3. Pumps
7 4. Starters
8 5. Valves
9

10
11 PART 2 PRODUCTS

12
13 2.1 MANUFACTURERS

- 14
15 A. Seton
16
17 B. Brady
18

19 2.2 EQUIPMENT LABELS

- 20
21 A. Type:
22 1. Engraving-Stock, melamine plastic laminate, 3 layer.
23 a. Thickness:
24 (1) Less than 25 square inches: 1/16 inch
25 (2) 25 square inches or more: 1/8 inch
26
27 B. Color:
28 1. Black
29
30 C. Conform to FS L-P-287
31

32 2.3 LETTERING

- 33
34 A. Style:
35 1. Engraved standard print, unless otherwise indicated.
36
37 B. Size:
38 1. 3/16 inch to 1/4 inch
39
40 C. Color:
41 1. White letters, black background
42

43 2.4 SIGN INFORMATION

- 44
45 A. Plumbing Equipment:
46 1. Unit mark from Drawings/Owner
47 2. Voltage - Phase

1 3. Manufacturer and Model Number

2
3 2.5 NAMEPLATE FASTENERS

- 4
5 A. Securely attach nameplates to equipment with non-corroding stainless steel screws.
6
7 B. Non-corroding pop rivets are acceptable.
8
9 C. Stick-ons or adhesives will not be allowed.

10
11 2.6 PIPING AND CONTROL DIAGRAM SIGNS

12
13 A. Material:

- 14 1. 1/4 inch acrylic cover and backing screwed together with brass screw/bolts.
15 2. Size:
16 a. Minimum:
17 (1) 12" x 17"
18 b. Maximum:
19 (1) 24" x 36"

20
21 B. Provide a diagram in each mechanical room similar to the diagrams shown on the plans,
22 and/or as required for the area served.

23
24 C. Provide pipe markers with the following features.

- 25 1. Letters from 1/2" to 3-1/2":
26 a. Size letters to afford readability from the appropriate viewing position.
27 2. Repeated and reversed words for viewing from 360° around pipe.
28 3. Self-clinging, coiled markers that snap into place around pipe and do not require any
29 other securement.
30 4. Integral directional arrows.

31
32 D. Letters on Field:

- 33 1. Identify the specific material conveyed, e.g., "Domestic Cold Water", "Domestic Hot
34 Water", etc.

35
36 E. Model:

- 37 1. Less than 3/4":
38 a. Tags, same as Paragraph. Piping System Devices, color codes for hazard.
39 2. 3/4" up to 6":
40 a. Seton Setmark SNA snap-on.
41 3. Over 6":
42 a. Seton Setmark STR strap-on, with stainless steel spring straps.
43 4. Use Seton Ultra-Mark for outdoor use.
44

1 F. Piping System Devices (Valves, Thermometers, Pressure Gages, etc., and Pipe Less Than
2 3/4"):

3 1. Identify with the following:

4 a. Tags:

5 (1) Not less than 1-1/2 inch brass or aluminum tags, round, square, or
6 octagonal.

7 b. Stamp tags with minimum 1/2" high descriptive characters, 1/2" high numbers
8 with black enamel-filled indentations.

9
10 G. Attachment:

11 1. Stainless steel or solid brass jack chain; Seton JA16, or stainless steel or brass "S"
12 hooks

13
14 H. Underground Warning Tapes:

15 1. Provide materials that meet the codes or have the approvals listed below:

16 a. Office of Pipeline Safety Regulation, USAS Code B31.8.

17 b. GSA Public Building Service Guide Specification.

18 c. National Transportation Safety Board Report NTSB-PSS-73-1.

19 d. AGA Report 72-D-56.

20 e. API Report API RP 1109.

21 2. Material:

22 a. Plastic, continuous tape, color-coded, marked for hazard.

23 b. For Non-metallic Piping System:

24 (1) Aluminum foil core encased in plastic.

25 c. Metallic Piping:

26 (1) Plastic tape.

27 3. Color:

28 a. Colored (not printed color) plastic, coded for material conveyed by piping.

29 4. Width:

30 a. As scheduled for piping system burial depth.

31 5. Legend:

32 a. "Caution [System Name] Line Buried Below".

33 6. Tape Colors:

34
35

Utility	Color
Natural Gas, Oil, Dangerous Materials	Hi Visibility Safety Yellow
Communications	Safety Alert Orange
Water Systems	Safety Precaution Blue
Sewer Systems	Safety Green

36
37
38
39
40

41 I. Model:

42 1. Metallic Piping System: Seton Polyethylene Tape.

43 2. Non-Metallic Piping System: Seton Metallic Detection Tape.

44
45 J. Underground Gas Piping:

46 1. Attach No. 18 gauge copper tracer wire to the piping and terminate above grade at
47 each end.

- 1
2 K. Pipeline Markers for Pipe Beneath Pavement and Slabs:
3 1. Minimum 2" round, square, or octagonal, same as specified in Subparagraph: Piping
4 System Devices.
5 2. Attachment:
6 a. 1-1/2" screw, bolted to tag as anchor.
7 b. Anchor Setting Compound: Epoxy or epoxy grout, compatible with the
8 pavement.
9

10
11 PART 3 EXECUTION

12
13 3.1 GENERAL

- 14
15 A. Contractor shall verify room numbers with Owner/Engineer before nameplates are
16 fabricated.
17
18 B. The following shall be permanently and clearly identified:
19 1. Each valve and pump.
20 2. Each valve whose service and/or duty is not immediately apparent.
21

22 3.2 INSTALLATION

- 23
24 A. Install signs on non-removable panels. Attach to equipment with pop rivets or stainless
25 steel screws.
26
27 B. Mount in an easily visible location.
28
29 C. All labeling identification shall conform to final room numbers. Coordinate with General
30 Contractor, Architect and Owner to secure construction room numbers.
31
32 D. Provide all additional signage required by local authority at no cost to the Owner.
33
34 E. Complete installation in accordance with ANSI A13.1 and manufacturer's installation
35 instructions and with the Drawings. Fasten each unit securely in place with stainless steel
36 screws.
37
38 F. Equipment Labeling:
39 1. Install on scheduled items of equipment, including the following:
40 a. Water heaters
41 b. Pumps
42 c. Control panels and major control components
43 d. Other items of equipment
44 e. Include Mark Number and descriptive name from Drawing and Specification
45 schedules
46 f. Attach with corrosion resistant, stainless steel screws or pop rivets

- 1 g. Install 1/2" diameter adhesive marker (color to be approved by Architect), and
 2 apply to T-bar below any mechanical equipment and fire dampers above lay-in
 3 ceiling.
- 4 2. Spacing:
- 5 a. Where pipe passes through walls, floors, and other barriers.
- 6 b. In Tunnel Vaults and Equipment Rooms:
- 7 (1) Maximum spacing, 10 feet; closer where piping is congested, and where
 8 piping continuity is obscured from view.
- 9 c. Piping in Tunnels:
- 10 (1) Maximum spacing 100 feet
- 11 d. Other Places:
- 12 (1) Maximum spacing 50 feet
- 13
- 14 G. Piping System Color Coding:
- 15 1. Designate for painter the following:
- 16 a. Types of piping services
- 17 b. Direction of flow
- 18 c. Other information required for proper identification.
- 19
- 20 H. Surfaces to be Painted:
- 21 1. Bare piping
- 22 2. Insulation covering of insulated piping
- 23
- 24 I. Paint according to the following schedule:
- 25 **Pastel**
- 26 **System Color**
- 27 Exposed Domestic Cold Water Blue
- 28 Waste and Vent None
- 29 Exposed Gas Piping Black
- 30
- 31 J. Piping System Devices (Valves, Thermometers, Pressure Gages, etc.):
- 32 1. Identify with the following information:
- 33 a. System
- 34 b. Device number
- 35 c. Device Function
- 36 2. Device Chart:
- 37 a. Key devices to device chart
- 38 b. Give complete description of device function and system.
- 39
- 40 K. Key devices to drawings as follows:
- 41 1. Floor plans
- 42 2. Schematic drawings of piping systems
- 43

1 L. Underground Warning Tapes:

2 1. Tape Widths:

3

Piping Burial Depth	Tape Width
4 10"	2"
5 20"	3"
6 27"	6"
7 30"	9"
8 40"	12"
9 50" or more	18"

10

11

12 M. Recommended Tape Bury Depth:

13 1. Minimum Depth:

14 a. 6".

15 2. Distance Between Pipe and Tape:

16 a. Minimum 12".

17 3. Maximum Depth:

18 a. 12".

19

20 N. Tie tape to pipe where pipe leaves the ground.

21

22 O. Pipeline Markers for Pipe Beneath Pavement and Slabs.

23 1. Location:

24 a. Accuracy:

25 (1) Plus or minus 6" from piping centerline.

26 b. Flat Edge Pavement and Slabs:

27 (1) Set within 6" of pavement or slab edge.

28 c. Concrete Curbs:

29 (1) Set in top of curb.

30 d. Spacing:

31 (1) Each change in direction, each edge of pavement or slab, maximum spacing
32 of 100'.

33

34 P. Legend:

35 1. Same as tags plus an engraved or stamped line; set marker with line parallel to buried
36 line.

37

38 Q. Attachment:

39 1. Drill hole for anchor bolt, full depth of bolt plus 1/2"; set full tag and bolt in epoxy,
40 flush with pavement or slab.

41

42 END OF SECTION

1 SECTION 22 07 20

2
3 PIPING INSULATION

4
5
6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.
12

13 1.2 SECTION INCLUDES

- 14
15 A. Fiberglass insulation
16 1. Applications:
17 a. Above ground domestic cold water
18 b. Horizontal portions of waste lines above grade which receive condensate from
19 air handling units
20 c. Condensate drain lines
21 d. Domestic hot water piping
22

23 1.3 RELATED SECTIONS

- 24
25 A. Section 22 00 10 - Basic Plumbing Requirements
26
27 B. Section 22 11 17 - Domestic Water Piping and Appurtenances
28
29 C. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances
30

31 1.4 SUBMITTALS

- 32
33 A. Product Data:
34 1. Provide submittal data on all equipment specified in this section in accordance with
35 Section 22 00 10, General Conditions, and Division 01.
36 2. Submit product data indicating typical catalog of information.
37 3. Submit product data sheets indicating dimensions, general assembly, and ratings.
38 4. Submit manufacturer's installation instructions and method of application.
39

40 1.5 REFERENCES

- 41
42 A. Refer to Section 22 00 10 for complete names of references identified in this section.
43

44
45
46
47

ASTM E 84	Fire and Smoke Ratings
ASTM C 547	Standard Specifications for Mineral Fiber Pipe Insulation
ASTM C 585	Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)

1	ASTM C 795	Standard Specifications for Thermal Insulation for Use in Contact
2		with Austenitic Stainless Steel
3	ASTM C 1136	Standard Specification for Flexible, Low Permeance Vapor
4		Retarders for Thermal Insulation
5	NFPA 255	Surface Burning Characteristics of Building Materials
6	UL 723	Composite Surface Burning Characteristics

7
8 1.6 DEFINITIONS

9
10 A. Concealed:

- 11 1. Hidden from sight as in trenches, chases, furred spaces, walls, pipe shafts, or hung
12 ceilings.

13
14 B. Exposed:

- 15 1. Not "concealed" as defined above. Normally open and visible to building occupants
16 (such as gymnasiums).

17
18 1.7 QUALITY ASSURANCE

19
20 A. Fire Hazard Rating:

- 21 1. All insulation used on the project must have a flame spread rating not exceeding 25
22 and a smoke developed rating not exceeding 50 as determined by test procedures
23 ASTM E84, NFPA 255 and UL 723.
24 2. These ratings must be tested on the composite of insulation, jacket or facing, and
25 adhesive.
26 3. Components such as adhesives, mastics and cements must meet the same individual
27 ratings as minimum requirements.

28
29 B. Quality Controls:

- 30 1. All insulation shall be the product of reputable manufacturers.
31 2. All insulation shall be applied by mechanics skilled in the use of various materials,
32 and in the employ of a concern regularly engaged in the insulating business. Submit
33 qualifications of insulator with insulation submittals.
34 3. The materials shall be applied in accordance with the special materials as required by
35 these specifications and by the manufacturer standards.
36 4. Poor workmanship or appearance will be cause for rejection.

37
38 PART 2 PRODUCTS

39
40 2.1 MANUFACTURERS

41
42 A. Armstrong

43
44 B. Johns Manville

45
46 C. Knauf
47

1 D. Owens/Corning

2
3 2.2 GENERAL

4
5 A. Molded pipe insulation shall be manufactured to meet ASTM C 585 and ASTM C 547
6 for sizes required for the particular system and shall be suitable for installation on piping
7 systems defined.

8
9 2.3 ABOVE GROUND PIPE INSULATION

10
11 A. Density:

12 1. 3/4 lb. per cubic foot.

13
14 B. Minimum R value:

15 1. 4.0 per inch of thickness.

16
17 C. Construction:

18 1. Fiberglass with factory-applied, all service reinforced vapor barrier jacket having
19 integral laminated aluminum vapor barrier and double adhesive self-sealing lap.

20
21 D. Thickness:

22 1. Domestic Cold Water Piping:

23 a. Interior walls and above ceilings:

24 (1) 1/2 inch

25 b. Exterior walls:

26 (1) 1 inch

27 2. Condensate Lines:

28 a. 1/2 inch

29 3. Waste Lines Which Receive Condensate:

30 a. 1/2 inch

31 4. Domestic Hot Water Piping (Up to 169° F):

32 a. 2" diameter and less:

33 (1) Interior walls and above ceilings: 1 inch

34 (2) Exterior walls: 1 inch

35 b. 1¼ inch diameter and larger:

36 (1) 1 inch

37 c. Outdoor:

38 (1) 2 inch

39
40 E. Make/Model:

41 1. Owens Corning ASJ/SSL-II

42
43 2.4 FLANGE, VALVE AND FITTING INSULATION

44
45 A. Exposed Piping:

46 1. Provide molded or mitered covers with full thickness matching adjacent covering.

47 2. Finish with white glass, reinforced white vapor barrier coating.

- 1
2 B. 2½ Inch Diameter and Larger Concealed Piping:
3 1. Insulate fittings and valves with molded or mitered fitting covers.
4 2. Finish with white vapor barrier coating reinforced with white 10" x 10" reinforced
5 mesh.
6
7 C. 2 Inch Diameter and Smaller Concealed Piping:
8 1. Insulate fittings and valves with mineral wool and insulating cement to a thickness
9 equal to or greater than adjoining straight pipe.
10 2. Molded or mitered fittings finished with white vapor barrier coating reinforced with
11 reinforced mesh may be provided.
12
13 D. Underground Piping (hot water only):
14 1. Provide mitered covers with full thickness matching adjacent covering.
15 2. Field fabricated miter joints are not acceptable.
16 3. No insulation is required on underground domestic cold water piping.
17
18 E. Outdoor Piping:
19 1. Metal jacketing shall be 0.016" minimum aluminum or stainless steel with moisture
20 barrier, secured in accordance with jacket manufacturer's recommendations.
21 2. Use preformed fitting covers matching jacket used on straight pipe, with all joints
22 sealed with metal jacketing sealant.
23

24 2.5 SEALANT, ADHESIVE, AND FINISH
25

- 26 A. Sealant:
27 1. Manufacturers:
28 a. Foster 95-44
29 b. Childers CP-76
30 2. Usage:
31 a. Valve Covers
32 b. Anchors
33 c. Hangers
34 d. Metal Jacketing
35 e. Flashing Penetrations
36
37 B. Adhesive:
38 1. Manufacturer:
39 a. Foster 85-20/85-60 and Childers CP-127
40 2. Usage:
41 a. Longitudinal laps of the vapor barrier jacket
42 b. Butt joint covers.
43
44 C. Weather Barrier Mastic
45 1. Manufacturers:
46 a. Foster 46-50
47 b. Childers CP-10

- 2. Usage:
 - a. Used on above ambient piping/duct to protect insulation from weather.
 - b. Use in conjunction with reinforcing mesh.

D. Vapor Barrier Coating:

- 1. Manufacturer:
 - a. Foster 30-33 Vapor Out
 - b. Childers CP-33 Chil Out
- 2. Usage:
 - a. Glass fabric reinforcement.

E. Reinforcing Mesh

- 1. Manufacturers:
 - a. Foster Mast Afab
 - b. Childers Chil-glass #10

2.6 INSULATION SHIELD

A. Field-fabricated:

- 1. Material:
 - a. High-density fiberglass insulation
- 2. Construction:
 - a. Insulation to support the bearing area at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference. When pipe is guided at top and bottom, metal shields should cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide with respect to insulation.
- 3. Schedule:
 - a. 3" and smaller pipe diameter:
 - (1) 12 inch insulated section, 18 gauge metal shield
 - b. Greater than 3" pipe diameter:
 - (1) 12 inch insulated section, 16 gauge metal shield

B. Factory-made:

- 1. Manufacturer:
 - a. Pipe Shields, Inc. or equal.
- 2. Type:
 - a. Proper shield for service and pipe span.
- 3. Construction:
 - a. Extend insulation at least 1 inch beyond metal.

C. Insulation shall not compress at hanger.

PART 3 EXECUTION

1 3.1 SITE INSPECTION

- 2
- 3 A. Before starting work under this section, carefully inspect the site and installed work of
- 4 other trades and verify that such work is complete to the point where installation of
- 5 materials and accessories under this section can begin.
- 6
- 7 B. Verify that all materials and accessories can be installed in accordance with project
- 8 drawings and specifications and material manufacturers' recommendations.
- 9
- 10 C. Verify, by inspecting product labeling, submittal data, and/or certifications which may
- 11 accompany the shipments, that all materials and accessories to be installed on the project
- 12 comply with applicable specifications and standards and meet specified thermal and
- 13 physical properties.
- 14

15 3.2 PROPERTIES

- 16
- 17 A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean
- 18 and dry.
- 19
- 20 B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-
- 21 applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation
- 22 shall not be acceptable for installation.
- 23
- 24 C. Ensure that pressure testing of piping and fittings has been completed prior to installing
- 25 insulation.
- 26

27 3.3 INSTALLATION

- 28
- 29 A. General:
- 30 1. Install all insulation materials and accessories in accordance with manufacturer's
- 31 published instruction and recognized industry practices to ensure that it will serve its
- 32 intended purpose.
- 33 2. Install insulation on piping subsequent to installation of heat tracing, painting, and
- 34 acceptance tests.
- 35 3. Install insulation materials with smooth and even surfaces. Insulate each continuous
- 36 run of piping with full-length units of insulation, with single cut piece to complete
- 37 run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly
- 38 to ensure complete, tight fit over all piping surfaces.
- 39 4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation,
- 40 protecting it against puncture, tears or other damage. All staples used on cold pipe
- 41 insulation shall be coated with suitable vapor barrier coating to maintain vapor
- 42 barrier integrity.
- 43

44 3.4 PIPE

- 45
- 46 A. Insulation size shall match pipe size.

- 1
2 B. Insulation to be continuous through wall and ceiling penetrations.
3
4 C. Apply insulation to clean, dry pipes.
5
6 D. Butt insulation joints firmly together and apply butt strip. All pipe insulation ends shall
7 be tapered and sealed.
8
9 E. Butt pipe insulation against hanger inserts. Seal jacketing according to type used.
10
11 F. Seal longitudinal laps and butt strips with sealant in addition to the self-sealing laps.
12
13 G. Seal joints with adhesive and staple at 2" O.C. with outwardly clenching staples.
14
15 H. Seal all joints with vapor barrier coating.
16

17 3.5 VALVES, FLANGES, AND FITTINGS
18

- 19 A. Insulate all valves, flanges, and fittings with covers secured with Velcro with equivalent
20 thickness and composition installation on straight pipes.
21
22 B. Finish with 1/4 inch layer of Foster 30-33 or Childers CP-33 reinforced with reinforcing
23 mesh.
24
25 C. Factory made covers equal to Schuller Zeston are acceptable.
26

27 3.6 CONTROL VALVE COVERS
28

- 29 A. Fabricate special covers, complete with troweled-on vapor seal, shaped to accommodate
30 the valve stem. Insulation thickness shall be same thickness as adjoining pipe.
31
32 B. Seal covers to valve insulation properly with adhesive so that the seal may be broken with
33 a knife blade without damage to either part. Arrange so that cover can be removed and
34 replaced as necessary for operation of the valve.
35
36 C. Finish valve cover with glass cloth and two coats of vapor barrier coating.
37
38 D. Factory made covers are acceptable. Provide submittal.
39

40 3.7 REPAIRS AND REPLACEMENT
41

- 42 A. Replace any insulation that gets wet, whether now dry or not.
43
44 B. Repair any damage caused by condensation due to improper insulating.
45

1 3.8 EXPOSED PIPING

- 2
3 A. Insulate piping exposed to view with a glass fabric or canvas jacket with brushed on
4 coating to present a smooth finished look to a height of 8 ft. A.F.F. or use PVC cover.
5

6 3.9 OUTDOOR PIPING

- 7
8 A. Metal jacket shall be applied per manufacturer's recommendations. Longitudinal joints
9 shall be applied so they will shed water completely and be sealed completely with 1/8"
10 bead of metal jacketing sealant under each lap. Circumferential joints shall be closed using
11 preformed butt strips in accordance with manufacturer's recommendations.
12

13 3.10 SHIELDS:

- 14
15 A. Metal jacketing shall be 0.016-inch minimum aluminum or stainless steel with moisture
16 barrier, secured in accordance with jacket manufacturer's recommendations. Use bands
17 and seals of the same material. Use preformed fitting covers matching jacket used on
18 straight pipe, with all joints weather sealed with 1/8" bead of metal jacketing sealant under
19 each lap.
20

21 3.11 SHIELDS AND HANGERS

- 22
23 A. Piping hangers or anchors are not be in direct contact with pipe. Hangers are to on the
24 outside of the insulation with pipe shields at each hanger.
25
26 B. At the location of hangers or supports for pipes run above ground and finished with a
27 vapor seal insulation, provide rigid sections of cork, high density fiberglass, Foamglas,
28 calcium silicate or high density polyurethane, the same thickness as adjacent insulating
29 material to adequately support the pipe without compression of the insulating material
30 and cover with a vapor seal that is bonded to the adjacent insulation as described for
31 fittings in the lines. Wood inserts shall not be allowed. Hangers and supports for piping
32 insulation to receive a vapor barrier shall be installed exterior to the insulation.
33
34 C. Material Changes:
35 1. Wherever there is a change in materials on lines that are vapor sealed, apply a suitable
36 adhesive that is compatible with both materials, tapes, etc., as required to maintain
37 the vapor barrier.
38
39 D. Apply insulation around the hanger ring or anchor and pipe and carry vapor barrier
40 upward and outward along the hanger rod or anchor members to a point not less than 12
41 inches from the adjacent pipe.
42
43 E. Take care to avoid puncturing the vapor seal.
44
45 F. Finish insulation as specified for flanges, and seal over adjacent vapor barrier jacket.
46

1 3.12 FIELD QUALITY ASSURANCE
2

- 3 A. Upon completion of all insulation work covered by this specification, visually inspect the
4 work and verify that it has been correctly installed. This may be done while work is in
5 progress, to assure compliance with requirements herein to cover and protect insulation
6 materials during installation.
7

8 3.13 PROTECTION
9

- 10 A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation
11 with vapor barrier damage and moisture-saturated insulation.
12
13 B. The insulation contractor shall advise the general and/or the mechanical/plumbing
14 contractor as to requirements for protection of the insulation work during the remainder
15 of the construction period, to avoid damage and deterioration of the finished insulation
16 work.
17

18 END OF SECTION

1 SECTION 22 11 17

2
3 DOMESTIC WATER PIPING AND APPURTENANCES
4
5

6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS
9

- 10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.
12

13 1.2 SECTION INCLUDES
14

- 15 A. Domestic hot water piping.
16
17 B. Domestic cold water piping.
18

19 1.3 RELATED SECTIONS
20

- 21 A. Section 22 00 10 - Basic Plumbing Requirements
22
23 B. Section 22 05 24 - Valves - General
24
25 C. Section 22 05 30 - Pipe and Pipe Fittings - General
26
27 D. Section 22 33 34 - Access Doors
28
29 E. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers
30

31 1.4 REFERENCES
32

- 33 A. ASTM 61 - Standard Specification For Steam or Valve Bronze Castings
34
35 B. ASTM C27450 - Standard Specification For Brass Rod, Bar & Shapes
36
37 C. ASTM A126 - Standard Specification For Gray Iron Castings For Valves, Flanges & Pipe
38 Fittings
39
40 D. ASTM A105 - Standard Specification For Carbon Steel Forgings For Piping Applications
41
42 E. ASTM - American Society of Testing Materials
43
44 F. ASTM B813-00e1 - Standard Specification for Liquid & Paste Fluxes for Soldering of
45 Copper & Copper Alloy Tube
46

1 G. ASTM B828-02 - Standard Practice for Making Capillary Joints by Soldering of Copper
2 and Copper Alloy Tube and Fittings

3
4 H. ASTM B88-02 - Standard Specification for Seamless Copper Water Tube

5
6 I. PDI - Plumbing & Drainage Institute

7
8 J. NSF/ANSI Standard 61

9
10 1.5 SUBMITTALS

11
12 A. Provide submittal data on all items specified in this section in accordance with
13 Specification Section 22 00 10, General Conditions, and Division 01.

14
15 B. Submit product data sheets.

16
17
18 PART 2 PRODUCTS

19
20 2.1 UNDERGROUND PIPING

21
22 A. Type:

23 1. 2 Inch Diameter and Smaller:

24 a. Type "L" soft drawn commercially pure copper

25 2. 2½ Inch Diameter:

26 a. Type "L" hard drawn commercially pure copper

27 3. 3 Inch Diameter or Larger:

28 a. Type "L" hard drawn commercially pure copper

29
30 B. All copper meets ASTM B88 Standards.

31
32 2.2 UNDER SLAB PIPING

33
34 A. Type:

35 1. 2 Inch Diameter and Smaller:

36 a. Type "K" soft drawn commercially pure copper

37 2. 2½ Inch Diameter and Larger:

38 a. Type "K" hard drawn commercially pure copper

39
40 B. No joints will be permitted in piping runs beneath concrete slabs. All joints shall be made
41 in accessible areas above the slab (behind access doors in walls, in mechanical closets,
42 etc.).

43
44 C. All copper meets ASTM B88 Standards.

1 2.3 INTERIOR PIPING

2
3 A. Type:

- 4 1. Type "L" hard drawn commercially pure copper

- 5
6 B. All copper meets ASTM B88 Standards.

7
8 2.4 PIPE FITTINGS

9
10 A. Copper Piping:

11 1. Unions:

- 12 a. 150 lb. standard, 300 lb. water-oil-gas service copper with ground joints.

13
14 B. Dissimilar Metal:

- 15 1. Di-Electric Unions

16
17 2.5 PIPE JOINTS

18
19 A. Copper Piping:

20 1. Type: Solder fittings

- 21 a. Solid string, hard solder
22 b. Wire, hard solder
23 c. Cored solder will not be allowed

24 2. Type: Press-connect fittings

- 25 a. Copper and copper alloy fittings with EPDM elastomeric sealing element.
26 b. Unpressed fittings shall leak and not hold pressure.

27 3. Approved Manufacturers:

- 28 a. Viega ProPress
29 b. Nibco

30 4. Material:

- 31 a. Solder (1½" and Smaller):
32 (1) 95-1/2% tin, 4% copper and 1/2% silver
33 b. Solder (2" and Larger):
34 (1) "SILFOS15", 15% silver, 80% copper, 5% phosphorous

- 35 c. Flux:
36 (1) Non-corrosive, lead-free paste

37 5. Use a cast brass adapter when connecting copper pipe to screwed brass pipe.

38 6. Brand:

- 39 a. Silvabrite or similar brand

- 40
41 B. Conform to ASTM B813 and ASTM B828.

42
43 2.6 VALVES

44
45 A. Type:

46 1. Check Valves:

- 47 a. 125 lb. bronze check valve with "Buna-N" disc.

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2. Ball Valves:
 - a. 150 lb. bronze 1/4 turn ball valve with full port.
 - b. 300 lb. bronze 1/4 turn ball valve with full port. ASTM 61
 - c. 150 lb. lead free brass 1/4 turn ball valve with full port, CW511L alloy. ASTM C27450
 3. Temperature and Pressure Relief Valves:
 - a. ASME rated valve
 4. Gate Valves:
 - a. 125 lb. rising stem, double-disc bronze gate valves larger than 3 inches.
 5. Water Main Valves:
 - a. 150 lb. AWWA valve.
 6. Pressure Reducing Valves
 - a. 300 lb. bronze sealed spring cage, strainer
 7. Cast Iron: ASTM A126, Class B
 8. Cast Carbon Steel: ASTM A216, Grade WCB
 9. Forged Carbon Steel: ASTM A105, Grade II

B. Manufacturers:

1. Apollo
2. Crane
3. Grinnell
4. Jenkins
5. Jomar, T-100NGDZ
6. Kennedy
7. Milwaukee Valve Company
8. Nibco
9. Stockham
10. Walworth
11. Watts
12. Hammond

C. Provide valves where required to adequately control and isolate the various domestic water piping systems.

D. Provide valves at the connection point of all equipment.

E. Provide Di-Electric Unions at connection of dissimilar metal.

2.7 CONSTRUCTION

A. Provide valves designed for repacking under pressure when fully opened.

B. Equip with packing suitable for intended service.

C. Furnish with gland followers.

1 D. Provide valves rated greater than the design temperature and pressure for the intended
2 system.

3
4 E. All domestic cold water and hot water valves 2" and less shall be full port ball valves.
5

6 2.8 WATER HAMMER ARRESTORS 7

8 A. Water Hammer Protective Devices:

9 1. Usage:

10 a. Provide on hot and cold water supply lines. Locate between last two
11 flush/solenoid valves on supply lines or per manufacturer's recommendations.

12 b. In single toilets locate within 3-feet of fixture or per manufacturer's
13 recommendation.

14 2. Type:

15 a. As recommended by the manufacturer for the particular application.

16 b. Locate arrestor on shop drawings with size.

17 3. Manufacturer/Model:

18 a. Wade "Shokstop"

19 b. Sioux Chief "Hydra-Rester"

20 c. PPP "SC Series"

21 d. Mifab "MWH Series"
22

23 2.9 FREEZE PROTECTION 24

25 A. Heat Trace Tape:

26 1. Usage:

27 a. Provide on hot and cold water supply lines where freezing of the piping is a
28 concern.

29 2. Type:

30 a. Self-regulating heating cable, 5 watt per liner foot. Provide control panel and all
31 necessary controls and wiring.

32 3. Manufacturer/Model:

33 a. Raychem XL-Trace
34
35

36 PART 3 EXECUTION 37

38 3.1 INSTALLATION 39

40 A. All products to comply with NSF/ANSI Standard 61.

41
42 B. Install in accordance with the plans and Section 22 05 30.
43

44 C. Drainage:

45 1. Minimum Slope:

46 a. 1/8 inch per 10 feet.

2. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to higher level.
3. Slope branches to drain toward mains or risers.
4. Terminate low points of risers with drain valve piped to nearest hub or floor drain unless otherwise indicated.

D. Water Hammer Arrestors:

1. Install in accordance with PDI Standard WH201.

3.2 VALVES

- A. All valves, trap primers, etc. that are located behind access doors shall be located directly behind door and within 24" of plane of door.

3.3 INSTALLATION

- A. Install valves and stops in accessible locations.
- B. Provide where shown or as required to make system complete and readily maintained.
- C. Provide pressure reducing valve on domestic water main where hydrostatic pressure exceeds 80 psi.
- D. Isolation valves shall be located:
 1. Restroom Gang – Behind an 18" x 18" stainless steel access panel with screwdriver operated latch located in the Boy's or Men's restroom.
 2. Individual (private) Restrooms – Behind an 18" x 18" stainless steel access panel with screwdriver operated latch.
 3. Individual Fixtures – Above the ceiling within 12" of the water risers where ceiling is accessible. Above the ceiling behind ceiling access panel within 12" of the water riser where ceiling is not accessible.
 4. Isolation valves on the domestic cold water shall be provided in corridors to allow isolation of buildings wings, sections, areas.

3.4 FIELD QUALITY CONTROL

- A. Properly test water distribution systems with hydrostatic pressure in accordance with local plumbing code.
- B. Do not install trap primers, flush valves or other pressure sensitive devices until all tests are completed.
- C. Repair all leaks in pipes, fittings and accessories during this test period.
- D. Repeat hydrostatic test until no leaks are found for an entire 8 hour period.

1 E. Make joints in accordance with ASTM B828.

2
3 3.5 STERILIZATION

4
5 A. Solution:

- 6 1. Strength:
7 a. Minimum 50 parts per million
8 2. Agents:
9 a. Liquid Chlorine:
10 (1) Conform to U.S. Army Specification #4-1
11 b. Calcium Hydrochloride:
12 (1) Federal Specification O-C-114
13 c. Chlorinated Lime:
14 (1) Federal Specification O-C-114
15

16 B. Procedure:

- 17 1. Perform sterilization after testing has been satisfactorily completed.
18 2. Pump solution into a 1/4 inch opening provided in the water main next to the water
19 meter.
20 3. Conduct the sterilization process under the direction of the local health department.
21 4. After sterilization, flush the system with clean water until the residual chlorine
22 content is less than 3 ppm.
23 5. After flushing, the local health department will test and verify the cleanliness of the
24 system.
25

26 3.6 PLUMBING SCHEDULE

27
28 A. Minimum Size:

- 29 1. Water Closets (flush valve):
30 a. 1-1/4" cold water
31 2. Urinals:
32 a. 3/4" cold water
33 3. Sinks:
34 a. 1/2" cold water, 1/2" hot water
35 4. Mop & Service Sinks:
36 a. 1/2" cold water, 1/2" hot water
37 5. Hose Bibbs:
38 a. 3/4" cold water
39 6. Drinking Fountains:
40 a. 1/2" cold water
41 7. Lavatories:
42 a. 1/2" cold water, 1/2" hot water
43

44
END OF SECTION

SECTION 22 13 17

SOIL, WASTE AND SANITARY DRAIN PIPING, VENT PIPING, AND APPURTENANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Drain and vent piping within the building and underground laterals.

1.3 RELATED SECTIONS

- A. Section 22 00 10 - Basic Plumbing Requirements
- B. Section 22 11 17 - Domestic Water Piping and Appurtenances
- C. Section 22 13 18 - Condensate Piping
- D. Section 22 33 34 - Access Doors
- E. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers

1.4 REFERENCES

- A. Refer to Section 22 00 10 for complete names of references identified in this section.
Commercial Standard CS-188-59
ASTM D-2665-04 Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic
Drain, Waste & Vent Pipe & Fittings
ASTM A74-04 Standard Specification for Cast Iron Soil Pipe & Fittings

1.5 SUBMITTALS

- A. Provide submittal data on all items specified in this section in accordance with Specification Section 22 00 10, General Conditions, and Division 01.
- B. Submit product data on pipe, pipe fittings, trap primers, covers, cleanouts, etc.

PART 2 PRODUCTS

1 2.1 DRAIN PIPE AND FITTINGS

2
3 A. Material:

- 4 1. Schedule 40 PVC pipe and fittings conform to ASTM D-2665.
5 2. "Foam Core PVC" not allowed.
6

7 B. Conform to ASTM A74, ASTM 888 and ASTM C564.
8

9 2.2 VENT PIPE AND FITTINGS

10
11 A. Material:

- 12 1. Schedule 40 PVC pipe and fittings conform to ASTM D-2665.
13

14 B. Comply with ASTM A74 and ASTM C564.
15

16 2.3 CLEANOUTS

17
18 A. Size:

- 19 1. Identical with the line size up to a maximum diameter of 4 inches.
20

21 B. Type:

- 22 1. Compatible with the surrounding floor/wall.
23

24 C. Manufacturer:

- 25 1. Jay R. Smith
26 2. Josam
27 3. Mifab
28 4. Sioux Chief
29 5. Wade W-6000
30 6. Watts
31 7. Zurn
32

33 2.4 PLUGS

34
35 A. Wade 8590, Tapped brass cleanout plug only. PVC plugs not allowed.
36

37 B. Applications:

- 38 1. Each change in direction of soil lines
39 2. End of each continuous waste line
40 3. Foot of each riser within the building
41 4. 50 ft. intervals in interior horizontal lines
42

43 C. Construction: Secure covers with vandal-proof screws
44

45 D. Finished Floors:

- 46 1. Covers: Chromium plated, flush mounted, cast bronze with scoriated top surface.
47

- 1 E. Walls/Painted Surfaces:
2 1. Covers:
3 a. Furnish chromium plated covers.
4
- 5 F. Exterior Locations:
6 1. Traffic Areas:
7 a. Covers: Flush mounted, cast bronze covers with scoriated top surface
8 2. Non-Traffic Areas:
9 a. Encase in a 14" x 14" x 6" concrete pad
10 b. Manufacturer/Model:
11 (1) Wade W-8500 series
12
- 13 2.5 CLOSET FLANGE
14
- 15 A. Size: 4" to match sanitary sewer piping.
16
- 17 B. Type:
18 1. PVC or cast iron to match sanitary sewer piping.
19 2. PVC flanges to be provided with stainless steel ring for reinforcement.
20
- 21 C. Manufacturer
22 1. Oatley or equal
23
- 24 2.6 TRAP PRIMERS
25
- 26 A. Type:
27 1. Fully automatic valve with diaphragm operated piston.
28
- 29 B. Size:
30 1. Inlet:
31 a. 1/2 inch
32 2. Outlet:
33 a. 1/2 inch
34
- 35 C. Features:
36 1. Activated by a pressure drop.
37 2. No adjustment required.
38 3. Equipped with distribution unit for 1 to 4 traps.
39 4. Can be located anywhere in an active cold water line of 1½ inch or less that is directly
40 serving one or more flush valves.
41 5. Provide copper tubing from trap primer to protected trap.
42
- 43 D. Application:
44 1. Provide automatic trap primers at all floor drains and floor sinks on entire project
45 that are within 20 feet of a water closet supply line.
46

- 1 E. Manufacturer/Model:
2 1. Precision Plumbing Products, Inc. PO-500.
3
4 F. Furnished with AG-500 air gap fitting with alignment legs.
5
6 G. Type:
7 1. Electronic Trap Priming Manifold – Precision Plumbing Products – MP-500.
8
9 H. Size:
10 1. Inlet:
11 a. 1/2 inch
12 2. Outlet:
13 a. 1/2 inch each
14
15 I. Features:
16 1. Solenoid valve set to open for 10 seconds every 24 hours.
17 2. UL listed
18 3. Equipped with distribution unit for 1 to 4 traps.
19
20 J. Application:
21 1. Provide electronic trap primers at all floor drains, shower drains, and floor sinks on
22 entire project that are not within 30 feet of a water closet supply line/flush valve.
23 Coordinate with electrical contractor for required power.
24

25 2.7 SAND BACKFILL/EMBEDMENT

- 26
27 A. Sand for embedment shall be a free flowing material which contains no clay, is reasonably
28 free from organic material and does not form a muck or mud when wet. The gradation
29 shall be such that a minimum of 95% is retained on a #100 sieve. The P.I. of the soil
30 fraction passing the No. 40 sieve shall not be greater than 5.
31

32 2.8 EXPOSED INDIRECT WASTE LINES IN KITCHENS AND CONCESSIONS:

- 33
34 A. All exposed indirect waste lines in kitchens and concessions to be DWV copper material.
35 All joints to be soldered and turned down with elbow above floor sink or hub drain
36 (discharge below elbow to be cut at 45 degree angle).
37
38

39 PART 3 EXECUTION

40
41 3.1 INSTALLATION

- 42
43 A. Location:
44 1. Install a 12 gauge copper tracer wire on all underground sewers outside of building.
45

- 1 B. Slope:
2 1. Desired: 1/4 inch per foot
3 2. Minimum:
4 a. 1/8 inch per foot for diameter of 4 inch and larger if approved by local authority
5 and it is impractical to use 1/4 inch per foot.
6
7 C. Drain Pipe and Fittings:
8 1. Reduction fittings:
9 a. Use to connect two pipes of different diameter.
10 2. Directional changes:
11 a. Use 45 degree wyes, long sweep quarter bends, and sixth, eighth, and sixteenth
12 bends. Sanitary tees may be used on vertical stacks. Use long sweeps at the base
13 of risers.
14 b. Embed pipe on sand cushion approximately 2 pipe diameter below (minimum
15 4") and at least one diameter on each side and top in trench.
16 c. No hub couplings of any type can be used underground.
17
18 D. Traps:
19 1. Provide at each fixture unless a trap is built into the fixture.
20 2. Provide a deep seal trap and trap primers at each floor drain and hub drain.
21 3. Place traps so that the discharge from any fixture will pass through only one trap
22 before reaching a building drain.
23 4. Place each trap as near to the fixture as possible. Do not exceed the distances stated
24 in the governing codes up to a maximum of 8 feet.
25
26 E. Trap Primers:
27 1. Provide trap primers at all floor drains, floor sinks and hub drains on entire project.
28 2. Provide unions on each side of trap primer for service.
29 3. Manufacturer shall provide field start-up and review of installation on trap primers.
30
31 F. Hub Drains:
32 1. Install with the top of the hub 1/2 inch above the finished floor, unless otherwise
33 shown on the drawings.
34
35 G. Cleanouts:
36 1. Install so that they open in a direction opposite to the pipe flow or at a right angle.
37 2. At all wall cleanouts install tapped brass cleanout plug behind wall escutcheons.
38 3. Install vertically above the flow line of the pipe for "wye" branch and end-of-line
39 cleanouts.
40 4. Place cleanouts above the floors in pipe chases so that they will be accessible through
41 doors or bring through a wall and provide with flush covers.
42 5. Set cleanouts flush in floor slabs.
43 6. Place cleanouts in accessible locations. Exact locations of each shall be approved by
44 the Architect before installation. Locate all cleanouts within 2-feet of access door or
45 cover.
46

- 1 H. Plugs:
- 2 1. Install temporary plugs in all open sanitary drain pipes during construction to prevent
- 3 any foreign objects from entering the pipe.
- 4 2. All floor drains to have plugs until substantial completion.
- 5
- 6 I. Vent Piping:
- 7 1. Connections:
- 8 a. Connect two or more vents together and extend as one vent through the roof,
- 9 where practical.
- 10 b. Make vent and waste connections to stacks by using 45 degree wyees, long sweep
- 11 quarter bends, sixth, eighth, or sixteenth bends. Sanitary tees may be used on
- 12 the vertical stacks.
- 13 2. Flashing:
- 14 a. Use minimum 10-inch square, 4 pound lead flashing.
- 15 b. Flange the flashing to the lead sleeve.
- 16 c. Extend the flashing up and around the vent pipe.
- 17 d. Turn the flashing down inside the pipe at least 2 inches to make an absolutely
- 18 watertight joint.
- 19 e. For single-ply rooftop systems, flash according to the roofing specifications.
- 20 3. Location:
- 21 a. Do not locate any vent within 15 feet of an outside air intake.
- 22 4. Mop Sinks:
- 23 a. Mop sinks to be installed after substantial completion.
- 24 5. Termination:
- 25 a. 12 inch above roof deck or 2 inch above parapet, whichever is greater.

26

27 3.2 TESTING

28

- 29 A. Temporarily plug sanitary drain piping.
- 30
- 31 B. Fill the pipes with water.
- 32
- 33 C. Test the system in sections so that no section has a pressure less than 10 feet of water.
- 34
- 35 D. If the level of water has been decreased by leakage after a 24-hour period, then locate and
- 36 repair all leaks.
- 37
- 38 E. Repeat the test until there is no perceptible decrease in the water level over a 24-hour
- 39 period.
- 40
- 41 F. Sewer Pressurization Test:
- 42 1. Provide smoke pressure test after slab/floor is poured and again at substantial
- 43 completion.
- 44 2. All smoke test on the sanitary sewer system is to be performed before ceiling tiles
- 45 are installed, no exception.
- 46 3. After all water tests are complete, perform smoke test to ensure there are no air leaks
- 47 in building. Fill all p-traps with water and temporarily cap all vents prior to testing.

- 1 4. Procedure for Plumbing Sewer Pressurization Test Using a Visual Smoke Indicator:
 - 2 a. Contact your local city water department, some cities may provide and supervise
 - 3 a smoke test for your facility.
 - 4 b. Prior to the test, notify the local fire and police departments that you are
 - 5 conducting a smoke test of the facility.
 - 6 c. Prior to the test, turn off the fire alarms. The smoke will activate the alarm. After
 - 7 the test is complete the building will have to be ventilated to clear smoke and
 - 8 then the alarm can be reactivated.
 - 9 d. You are required to have a blower with an adjustable pressure control and liquid
 - 10 smoke or white smoke bombs.
 - 11 e. Inflatable ball stops are required to block off the sewer line at the building
 - 12 manhole that connects to the city sewer main line.
 - 13 f. All sewer vents on the facility have to be sealed to properly conduct the test.
 - 14 (Duct tape over the openings is acceptable.)
 - 15 g. Ladders, portable lights, two way radio communication and standard hand tools
 - 16 are required for access above ceilings, floor drains, etc.
 - 17 h. A minimum of three helpers are required to conduct the test.
 - 18 i. Prior to the test, identify rooms or problem areas that should be observed first.
 - 19 Plumbing drawings are required to identify the locations of vents, traps,
 - 20 restrooms, etc.
 - 21 j. This test will pressurize the sewer piping (approximately 1.25" S.P.) and identify
 - 22 any deficiencies.
 - 23 k. If there are questions, contact Estes, McClure & Associates, Inc.: Phone 903-
 - 24 581-2677.
- 25 5. Provide TV video of all main sanitary sewers in building and to city main. Notify
- 26 Owner's representative when video is to be made 48 hours prior to work.

27
28 G. Job Photographs:

- 29 1. Contractor is to provide digital photographs of all pipe showing sand embedment
- 30 prior to covering trenches.

31
32 3.3 PLUMBING BRANCH SCHEDULES

33
34 A. Minimum size:

- 35 1. Water Closets (flush valve):
 - 36 a. 3" waste, 2" vent
- 37 2. Urinals:
 - 38 a. 2" waste, 1-1/2" vent
- 39 3. Sinks:
 - 40 a. 2" waste, 1-1/2" vent
- 41 4. Mops & Service Sinks:
 - 42 a. 3" waste, 1-1/2" vent
- 43 5. Floor Drains:
 - 44 a. 3" waste, 1-1/2" vent

- 1
 - 2
 - 3
 - 4
 - 5
 - 6
- 6. Drinking Fountains:
 - a. 2" waste, 1-1/2" vent
 - 7. Lavatories:
 - a. 2" waste, 1-1/2" vent

END OF SECTION

1 SECTION 22 13 18

2
3 CONDENSATE PIPING

4
5
6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.
12

13 1.2 SECTION INCLUDES

- 14
15 A. Condensate piping for cooling units.
16

17 1.3 RELATED SECTIONS

- 18
19 A. Section 22 00 10 - Basic Plumbing Requirements
20
21 B. Section 22 05 30 - Pipe and Pipe Fittings - General
22
23 C. Section 22 07 20 - Piping Insulation
24
25 D. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and
26 Appurtenances
27
28 E. Section 22 33 34 - Access Doors
29

30 1.4 REFERENCES

- 31
32 A. ASTM B88 - Seamless Copper Tube for Water, Gas & Sanitation
33
34 B. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV)
35

36 1.5 DEFINITIONS

- 37
38 A. Draw-through Unit:
39 1. A unit in which the cooling coil operates under a negative static pressure.
40
41 B. Blow-through Unit:
42 1. A unit in which the cooling coil operates under a positive static pressure.
43

1 1.6 SUBMITTALS

2
3 A. Product Data:

- 4 1. Provide submittal data on all equipment specified in this section in accordance with
5 Section 22 00 10, General Conditions, and Division 01.
6 2. Submit product data indicating typical catalog of information.
7 3. Submit product data sheets indicating dimensions, general assembly, and ratings.
8
9

10 PART 2 PRODUCTS

11
12 2.1 GENERAL

- 13
14 A. Provide condensate lines for all cooling units even if not shown on the plans.
15
16 B. Provide a secondary condensate drain pan and secondary condensate piping for all
17 horizontal air handlers above ceiling, even if not shown on plans.
18
19 C. Minimum size:
20 1. 3/4", but no smaller than the coil nipple.
21

22 2.2 PIPING

- 23
24 A. Type:
25 1. Hard drawn type DWV or type M copper
26 2. Other type as noted on plans
27 3. Conform to ASTM B306 or ASTM B88.
28

29 2.3 FITTINGS

- 30
31 A. Type: Wrought copper joint
32 1. Provide dielectric insulating couplings between ferrous and copper piping systems.
33

34 2.4 INSULATION

- 35
36 A. All condensate lines shall be insulated per Section 22 07 20.
37

38 2.5 CONNECTIONS

- 39
40 A. Type:
41 1. Solid string hard solder
42 2. Wire hard solder
43 3. Cored solder will not be allowed.
44
45 B. Material:
46 1. Solder:
47 a. 95% tin and 5% antimony

- 1 2. Flux:
2 a. Non-corrosive paste type
3
4 C. Use a cast adapter when connecting soldered copper piping to screwed brass pipe.
5
6 2.6 ROOF PIPE SUPPORTS
7
8 A. Manufacturers:
9 1. MAPA MS-5
10 2. Miro Industries Model 3 RAH (3-inch or less)
11 3. Pipe Hangers and Devices (PHP) Model PP10
12 4. Portable Pipe Hangers (PHP) Model PP10
13 5. ERICO RPS 360407
14
15 B. All roof supports to be equal to MAPA Products Model MS-5, adjustable height, select
16 size designed for size of pipe supported. MS-5 for 4" and smaller.
17 1. Install 1/2" rubber walk pad under each pipe support.
18
19 C. MAPA MWP 1/2" thick rubber walk pad.
20 1. Coordinate exact locations of supports with roofing contractor.
21
22 D. Roof supports to support all gas piping a minimum of 6" above roof.
23 1. Coordinate exact locations of supports with roofing contractor.
24 2. Install 1/2" rubber walk pad under each pipe support.
25
26 E. Spacing of Supports (Horizontal):
27 1/2" 6 feet or less
28 3/4" or 1" 8 feet or less
29 1 1/4" or larger 10 feet or less
30 Install supports within 2 feet of every change of direction.
31
32 2.7 ACCESSORIES
33
34 A. Traps:
35 1. Draw-through units:
36 a. Required on all units, unless noted otherwise on plans.
37 2. Blow-through units:
38 a. As recommended by the unit manufacturer or as shown on the plans.
39
40 B. Clean-outs
41
42 C. Unions
43
44

1 PART 3 EXECUTION

2

3 3.1 INSTALLATION

4

5 A. Traps:

- 6 1. Install in each line serving a draw-through unit. Coordinate size and configuration
7 with air conditioning unit manufacturer.

8

9 B. Cleanouts:

- 10 1. Install cleanouts as shown on plans.

11

12 C. Unions:

- 13 1. Install unions on both sides of the trap.

14

15 D. Minimum Drain Line Slope:

- 16 1. 1/8 inch per foot
17 2. Insulate all condensate lines inside buildings.

18

19

END OF SECTION

1 SECTION 22 33 34

2
3 ACCESS DOORS

4
5
6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

12
13 1.2 SECTION INCLUDES

- 14
15 A. Access doors

16
17 1.3 RELATED SECTIONS

- 18
19 A. Section 22 00 10 - Basic Plumbing Requirements
20
21 B. Section 22 05 24 - Valves - General
22
23 C. Section 22 11 17 - Domestic Water Piping and Appurtenances
24
25 D. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances
26
27 E. Section 22 13 18 - Condensate Piping
28
29 F. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers

30
31 1.4 SUBMITTALS

- 32
33 A. Provide submittal data on all items specified in this section in accordance with
34 Specification Section 22 00 10, General Conditions, and Division 01.

35
36
37 PART 2 PRODUCTS

38
39 2.1 MANUFACTURERS

- 40
41 A. Acudor
42
43 B. Elmdor
44
45 C. Mifab
46

1 2.2 ACCESS DOORS

2
3 A. Locations requiring access doors:

- 4 1. Concealed valves
5 2. Traps
6 3. Trap primers
7 4. Controls
8 5. Cleanouts
9 6. Equipment above hard ceilings.
10 7. Other equipment requiring accessibility for operation and maintenance.

11
12 B. Type:

- 13 1. Hinged flush-type steel framed door with straps and exposed narrow border.
14

15 C. Minimum size:

- 16 1. 18" x 18" unless otherwise indicated.
17 2. 24" x 24" for equipment above hard ceilings.
18 3. Conform to architectural panel pattern for acoustical ceilings.
19 4. Confirm size with Building Inspector and Engineer.

20
21 D. Construction:

- 22 1. Hinges:
23 a. Concealed continuous type.
24 2. Locking Device:
25 a. Flush cam type, screw driver operated.
26

27 E. Fire Rating:

- 28 1. Same or better fire rating than the surrounding area.
29

30 F. Access doors located in kitchens, restrooms or areas where water is present shall be
31 stainless steel.
32

33 2.3 FACTORY PAINTING

- 34
35 A. Apply prime coat of rust inhibiting paint, unless located in wet area.
36
37

38 PART 3 EXECUTION

39
40 3.1 INSTALLATION

- 41
42 A. Install in accordance with manufacturer's instructions and recommendations.
43

- 44 B. In suspended acoustical ceilings, provide a beaded pin or other approved means for
45 identification and easy removal where necessary.
46

- 1 C. Access doors shall only be installed in areas/locations that are readily accessible.
- 2
- 3 D. Doors shall be installed in such a manner that door will open 180 degrees.
- 4

5 END OF SECTION

1 SECTION 22 40 01

2
3 PLUMBING FIXTURES AND FIXTURE CARRIERS
4

5
6 PART 1 GENERAL
7

8 1.1 RELATED DOCUMENTS
9

- 10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.
12

13 1.2 SECTION INCLUDES
14

- 15 A. ADA Accessories
16
17 B. Water closets
18
19 C. Urinals
20
21 D. Lavatories
22
23 E. Sinks
24
25 F. Fixture carriers
26
27 G. Thermostatic mixing valves
28
29 H. Back Flow Preventers
30
31 I. Other plumbing fixtures and equipment.
32

33 1.3 RELATED SECTIONS
34

- 35 A. Section 22 00 10 - Basic Plumbing Requirements
36
37 B. Section 22 05 30 - Pipe and Pipe Fittings - General
38
39 C. Section 22 11 17 - Domestic Water Piping and Appurtenances
40
41 D. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances
42
43 E. Section 22 33 34 - Access Doors
44

1 1.4 REFERENCES

- 2
- 3 A. ASHRAE 90-75 - American Society of Heating, Refrigerating & Air Conditioning
- 4 Engineers, Inc. (Energy Conservation Standard in New Buildings)
- 5
- 6 B. PDI WH201 - Plumbing & Drainage Institute (Water Hammer Arresters)
- 7
- 8 C. ANSI Z21.22 - American National Standards Institute (Relief Valves & Automatic Gas
- 9 Shutoff Devices)
- 10
- 11 D. AGA - American Gas Association
- 12
- 13 E. ADA - Americans With Disabilities Act
- 14
- 15 F. TAS - Texas Accessibility Standards
- 16
- 17 G. ASSE 1069 - Performance Requirements for Automatic Temperature Control Mixing
- 18 Valves
- 19
- 20 H. ASSE 1070 - Water Temperature Limiting Devices
- 21
- 22 I. ASSE 1071 - Performance Requirements for Mixing Valves for Emergency Showers
- 23

24 1.5 SUBMITTALS

- 25
- 26 A. Submit shop drawings and product data under provisions of Section 22 00 10, General
- 27 Conditions, and Division 01.
- 28
- 29 B. Indicate on submittal construction materials, finishes, sizes, quantities, and related
- 30 hardware.
- 31
- 32 C. Product Data:
- 33 1. Plumbing fixtures
- 34 2. Carriers
- 35 3. Fixture trim
- 36
- 37 D. Certification:
- 38 1. Submit certification that complete system complies with test requirements of
- 39 municipality, State, and other public authorities having jurisdiction over system.
- 40
- 41 E. Provide closeout documents as required in Division 01, Section 22 00 10.
- 42

43 1.6 QUALITY ASSURANCE

- 44
- 45 A. Provide faucets, fittings, supply stops and similar devices of one manufacturer.
- 46

1 B. Verify that the voltage is the same as scheduled on the electrical drawings. If not, change
2 at no cost to the Owner.

3
4 C. Regulatory Requirements:

5 1. Comply with requirements in following order of precedence:

- 6 a. Codes, laws, ordinances, rules, regulations or orders of any public authority
7 having jurisdiction over installation, inspection, and testing, including local
8 codes.
9 b. Provisions specified in this section.
10 c. Local Plumbing Code.

11
12 1.7 HANDLING

13 A. Deliver fixtures crated and in undamaged condition.

14 B. Replace damaged fixtures with new fixtures.
15
16
17

18
19 PART 2 PRODUCTS

20
21 2.1 GENERAL

22 A. All plumbing fixtures shall be new and as shown on the plans.

23 B. Furnish plumbing fixtures with carriers shown and all necessary trimming.

24 C. All porcelain enameled cast iron to be acid resistant.

25 D. All supplies shall be IPS brass with stops.

26 E. All exposed finished metal parts shall be chromium plated.

27 F. Rough bodied parts shall be heavily nickel plated.

28 G. Galvanized nipples will not be permitted.

29 H. Traps for lavatories, sinks, etc. shall be 17 gauge three-piece chrome plated cast brass with
30 cleanout and IPS tailpiece and chrome plated sleeve.

31 I. All escutcheons on supplies and waste shall be heavy cast brass set-screw type.

32 J. Furnish faucets and supply stops with renewable seats.
33
34

35
36
37
38
39
40
41
42
43 2.2 WATER CLOSETS, URINALS AND LAVATORIES

44 A. Approved Manufacturers:

- 45 1. American Standard
46
47

- 1 2. Eljer
- 2 3. Kohler
- 3 4. Sloan
- 4 5. Zurn

5

6 2.3 CARRIERS FOR WATER CLOSETS, URINALS AND LAVATORIES

7

8 A. Water Closets

- 9 1. Wade 300 Series
- 10 2. Watts
- 11 3. Mifab
- 12 4. Zurn
- 13 5. Josam

14

15 B. Urinals:

- 16 1. Wade 400 Series
- 17 2. Watts
- 18 3. JR Smith
- 19 4. Mifab
- 20 5. Zurn
- 21 6. Josam

22

23 C. Lavatories:

- 24 1. Wade 520 Series
- 25 2. Watts
- 26 3. JR Smith
- 27 4. Mifab
- 28 5. Zurn
- 29 6. Josam

30

31 2.4 WATER HYDRANTS

32

33 A. Approved Manufacturers:

- 34 1. Woodford
- 35 2. Wade
- 36 3. MAPA
- 37 4. Mifab
- 38 5. Josam
- 39 6. JR Smith
- 40 7. Zurn
- 41 8. Prier Products

- 42
- 43 B. All frost proof water hydrants mounted in building or roof shall be designed to not require
- 44 an independent drain line, unless specifically stated on construction drawings.
- 45

- 1 2.5 FAUCETS
2
3 A. Approved Manufacturers:
4 1. American Standard
5 2. Chicago
6 3. Delta
7 4. Symmons
8 5. Moen
9 6. T & S Brass
10 7. Zurn AquaSpec
11 8. Speakman
12

- 13 2.6 SINKS
14
15 A. Approved Manufacturers:
16 1. Elkay
17 2. Just
18

- 19 2.7 FLOOR DRAINS/FLOOR SINKS
20
21 A. Approved Manufacturers:
22 1. J.R. Smith
23 2. Josam
24 3. Mifab
25 4. Sioux Chief
26 5. Wade
27 6. Watts
28 7. Zurn
29

- 30 2.8 FLUSH VALVES
31
32 A. Approved Manufacturers:
33 1. Manual:
34 a. Sloan #111 Series Water Closets, #186 Series Urinals
35 b. Zurn #Z6000, WSI Water Closets, #Z-6003-WSI Urinals
36 2. Automatic Sensor Type: Battery Top Mount:
37 a. Sloan Water Closets: 8111, Urinals: Sloan 8186-0.5
38 b. (No Zurn Equals) 8111-1.28
39

- 40 2.9 THERMOSTATIC MIXING VALVES
41
42 A. Approved Manufacturers:
43 1. Acorn Controls
44 2. Apollo
45 3. Bradley
46 4. Conbraco

- 1 5. Leonard
- 2 6. Powers
- 3 7. Symmons

- 4
- 5 B. Thermostatic mixing valves for showers shall comply with ASSE 1069.
- 6
- 7 C. Thermostatic mixing valves for lavatories and sinks shall comply with ASSE 1070.
- 8 Provide inlet checkstops and inlet y-strainers.
- 9
- 10 D. Thermostatic mixing valves for emergency fixtures shall comply with ASSE 1071.

11

12 2.10 BACKFLOW PREVENTERS

13

- 14 A. Reduced Pressure Zone:
 - 15 1. Bronze or FDA approved epoxy coated cast iron body.
 - 16 2. Maximum Working Pressure: 175 psi
 - 17 3. Provide full line size strainer before reduced pressure zone assembly.
 - 18 4. Provide air gap assembly.
- 19
- 20 B. Approved Manufacturers:
 - 21 1. Apollo
 - 22 2. Conbraco
 - 23 3. Watts
 - 24 4. Zurn

25

26

27 PART 3 EXECUTION

28

29 3.1 PREPARATION

30

- 31 A. All equipment surfaces coming in contact with walls, floors, or surfaces of other fixtures
 - 32 shall be ground truly flat and shall be bedded with fine dental plaster.
 - 33
 - 34 B. Install an approved vacuum breaker or backflow preventer on each water supply line
 - 35 serving a plumbing fixture which has a water supply below the rim of the fixture. Vacuum
 - 36 breakers shall be designed to prevent any possible backflow through them. Where these
 - 37 are installed in chrome plated lines, they shall be chrome plated to match.
 - 38
 - 39 C. Provide and install a check valve on the cold water supply serving each and every water
 - 40 heater on project.
 - 41
 - 42 D. Temperature and pressure relief line to be piped full sized and in copper to exterior of
 - 43 building, or as noted on plans.
 - 44
 - 45 E. Set water heater storage temperature to 140°F.
- 46

1 3.2 INSTALLATION

- 2
- 3 A. Furnish and completely install all fixtures shown on plans and as specified.
- 4
- 5 B. Properly anchor all fixtures, lines, or equipment to construction.
- 6
- 7 C. Clean all plumbing fixtures before final inspection and acceptance by the Architect.
- 8
- 9 D. Install all fixtures to proper heights as shown on the plans and in the codes. Refer to
- 10 Texas Accessibility Standards. Coordinate height with plans. If different from engineering
- 11 plans, contact the Architect for the correct height. Do not install until written approval is
- 12 issued by the Architect. If fixture cannot be installed to proper height given, contact
- 13 Architect for direction. No cost changes will be allowed for changes to piping to correct
- 14 the problem.
- 15
- 16 E. Install Handi Lav-Guard Kits per manufacturer on ADA lavatories.
- 17
- 18 F. Provide and install thermostatic mixing valves at all ADA lavatories, sinks, wash stations
- 19 and lavatory systems.
- 20
- 21 G. Install water heater expansion tank on cold water entering the water heater or storage
- 22 tank.
- 23
- 24 H. Horizontal Y-Strainers shall be located:
- 25 1. On domestic water main entry into the building provide a horizontal Y-strainer
- 26 downstream of the building isolation valve and upstream of the backflow preventer.
- 27 2. Where infrared controlled lavatories or hand sinks are provided downstream of the
- 28 supply stops exposed under the fixture.
- 29 3. In gang or private (individual) restrooms directly downstream of the isolation valves
- 30 behind the access panel.
- 31

32 3.3 FIELD QUALITY CONTROL

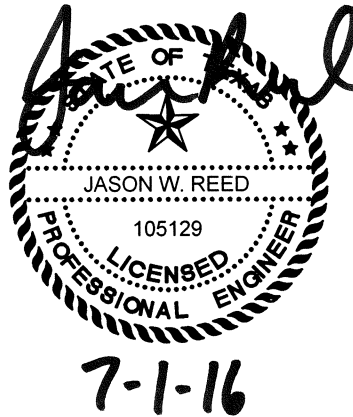
- 33
- 34 A. Inspect all faucets, flush valves, stop valves and other equipment for proper amount of
- 35 water discharged. Adjust as required to meet low water consumption and ADA/Texas
- 36 Accessibility Standards.
- 37
- 38 B. Correct any faucet or other equipment as directed by the Architect/Engineer.
- 39
- 40 C. Protect all drains during construction. Install covers on all floor drains and floor sinks
- 41 until substantial completion.
- 42
- 43 D. Do not install mop sinks until substantial completion.
- 44

45 END OF SECTION

HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

DIVISION 23

- 23 00 10 Basic Mechanical Requirements
- 23 05 32 Roof Curbs
- 23 05 34 Isolation Devices
- 23 05 54 Mechanical Identification
- 23 07 01 Duct And Grille Insulation
- 23 08 01 Air Balance & System Testing
- 23 09 24 Energy Management Control System (EMCS) BACnet
- 23 31 01 Ductwork
- 23 33 34 Access Doors
- 23 34 01 HVAC Fans
- 23 36 17 Variable Air Volume
- 23 37 14 Air Distribution Devices



1
2 SECTION 23 00 10

3 BASIC MECHANICAL REQUIREMENTS
4
5

6 PART 1 GENERAL
7

8 1.1 RELATED DOCUMENTS
9

- 10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 23 00 10, apply to this Section.
12

13 1.2 SECTION INCLUDES
14

- 15 A. Basic mechanical requirements necessary to provide complete installation of all Division
16 23 work.
17

18 1.3 WORK INCLUDED
19

- 20 A. This section of work comprises furnishing of all materials, equipment, tools, scaffolding,
21 rigging, hoisting, labor and transportation necessary for the complete installation of the
22 mechanical systems as shown on the plans and as specified herein.
23

- 24 B. Bidders shall determine the contents of a complete set of drawings and specifications and
25 be aware that they may be bidding from a partial set of drawings, applicable only to the
26 various separate contracts, subcontracts, or trades as may be issued for bidding purposes
27 only. The contract documents and the complete scope of work for the project are
28 illustrated on the combined Architectural, Structural, Plumbing, Heating, Ventilating, Air
29 Conditioning and Electrical, and each Bidder shall thoroughly acquaint himself with all
30 the details of the complete set of drawings and specifications before submitting his bid.
31 All drawings and specifications form a part of the contract documents for each separate
32 contract and shall be considered as bound therewith in the event partial sets of plans and
33 specifications are issued for bidding only. The submission of bids shall be deemed
34 evidence of the review and examination of all drawings, specifications, and addenda issued
35 for this project as no allowances will be made because of unfamiliarity with any portion
36 of the complete set of documents.
37

38 1.4 RELATED SECTIONS
39

- 40 A. The conditions of the Division 01 requirements and the contract requirements which
41 include the General Conditions and the Supplementary Conditions apply to the work of
42 this division.
43

1 1.5 CODES & REFERENCE STANDARDS

2
3 A. General:

- 4 1. Perform all Division 23 work in strict accordance with the requirements and
5 recommendations stated in the codes and standards except when requirements are
6 modified by the contract documents.
7 2. Nothing in the Contract Documents shall be construed to permit work not
8 conforming to these codes.
9 3. When two or more codes or standards are applicable to the same work, then the
10 stricter code or standard shall govern.
11 4. The date of the code or standard that is in effect on the date of issue of the contract
12 documents except when a particular publication date is specified.
13 5. The Contractor shall be held responsible for verifying all local codes and ordinances
14 that may alter any part of the plans or specifications. The Contractor shall bear all
15 costs for correcting the deficiencies.
16 6. Where local codes and ordinances are not in writing or on record but a local
17 precedence has been set, the Owner shall pay for any additional cost incurred.
18

19 B. Applicable Codes and Standards for All Division 23 Work:

- 20 1. International Building Code
21 2. International Gas Code
22 3. International Plumbing Code
23 4. International Mechanical Code
24 5. International Energy Conservation Code
25 6. National Electrical Code
26 7. American Society of Heating, Refrigerating and Air Conditioning Engineers
27 Standards.
28 8. Occupational Safety and Health Administration Standards:
29 a. OSHA Standard 2207 - Construction Industry Standards
30 b. OSHA 29 CFR Part 1926 – Regulation of Excavation
31 c. Texas Underground Facility Damage Prevention Act (H.B. 2295)
32 d. All other applicable standards
33 9. National Fire Protection Association:
34 a. NFPA No. 90A Installation of Air Conditioning and Ventilating Systems
35 10. Fire Sprinkler System:
36 a. NFPA 13
37 b. NFPA 14
38 c. NFPA Life Safety Code 101 Section 8-3
39 d. All other applicable codes
40 11. National Appliance Energy Conservation Act of 1987
41 12. Texas State Board of Insurance Standards
42 13. Clean Air Act and Clean Air Act Amendments of 1990
43 14. State Codes:
44 a. Texas Department of Labor Boiler Rules and Regulations
45 b. All other applicable codes
46 15. Local Municipal Codes and Ordinances
47

1 1.6 SCHEDULE OF ABBREVIATIONS

- 2
- 3 A. Reference Standards are listed in Section 23 using abbreviations listed below:
- 4 AABC Associated Air Balance Council
- 5 AASHTO American Association of State Highway and Transportation Officials
- 6 ADA Americans with Disabilities Act
- 7 ADC Air Diffusion Council
- 8 AGA American Gas Association
- 9 AMCA Air Moving and Conditioning Association
- 10 ANSI American National Standards Institute
- 11 AHRI Air-Conditioning and Refrigeration Institute
- 12 ASHRAE American Society of Heating, Refrigerating and Air-Conditioning
- 13 Engineers
- 14 ASME American Society of Mechanical Engineers
- 15 ASPE American Society of Plumbing Engineers
- 16 ASTM American Society for Testing and Materials
- 17 AWE American Welding Society
- 18 AWWA American Water Works Association
- 19 CGA Compressed Gas Association
- 20 CISPI Cast Iron Soil Pipe Institute
- 21 CS Commercial Standard
- 22 CSA Canadian Standards Association
- 23 DIPRA Ductile Iron Pipe Research Association
- 24 DOT Department of Transportation
- 25 DOC Department of Commerce
- 26 FCC Federal Communications Commission
- 27 FM Factory Mutual
- 28 FS Federal Specification
- 29 IBC International Building Code
- 30 IIL Independent Testing Laboratories
- 31 NEC National Electric Code
- 32 NFPA National Fire Protection Association
- 33 NSF National Sanitation Foundation
- 34 OSHA Occupational Safety and Health Administration
- 35 PDI Plumbing and Drainage Institute
- 36 SMACNA Sheet Metal and Air Conditioning National Association
- 37 TCEQ Texas Commission on Environmental Quality
- 38 TDH Texas Department of Health
- 39 TWC Texas Water Commission
- 40 UL Underwriters Laboratories

41

42 1.7 QUALITY ASSURANCE

- 43
- 44 A. Provide complete installations of all systems.
- 45
- 46 B. Furnish all items of equipment, material, and labor to complete the Contract even though
- 47 each and every item necessary is not specifically mentioned or shown.

- 1
2 C. In case of any conflict between the specifications, plans and ordinances, the ordinances
3 shall govern.
4
5 D. All materials furnished under this Contract shall be new, free from defects of any kind,
6 of the quality and design hereinafter specified, and shall conform to the standards of
7 Underwriter's Laboratories Inc., except for equipment which U.L. does not list or provide
8 label service.
9
10 E. All mechanical equipment and fixtures shall be the same brand unless scheduled
11 differently on plans.
12
13 F. Contractor's Responsibility:
14 1. Erect barricades, protective fencing, and signs to prevent injury to personnel on site.
15 2. Make permanent connection to utilities or existing lines. Determine depth and
16 location, and bid accordingly.
17 3. Relocate and repair any existing lines cut by general construction work.
18 4. Pay all costs in connection with metering devices.
19 5. Plans do not show exact location and elevations of lines, nor do they show all offsets
20 required.
21 6. Deviate from plans as required to conform to the general construction and provide
22 proper grading.
23 7. Maintain all utility services during construction to existing portions of job that
24 remain.
25 8. Procure and pay for all necessary permits or licenses to carry out the work.
26 9. Obtain and pay for all the necessary certificates of approval which must be delivered
27 to the Architect/Engineer before final acceptance of the work.
28 10. Periodically remove rubbish, clean or repair all surfaces marred by the work required
29 under this contract.
30 11. Protect work from damage by other trades.
31 12. Make all tests required by law; pay all costs in connection with the testing.
32 13. Where job conditions require changes in indicated locations and arrangement, make
33 such changes without extra cost to Owner.
34 14. Provide motor starters, controls, relays, all low-voltage wiring, conduit and wiring
35 related to HVAC and other equipment and devices to form a complete working
36 system. See Section 26 00 00.
37

38 1.8 DEFINITIONS
39

- 40 A. Approval:
41 1. It is understood that approval must be obtained from the Architect/Engineer in
42 writing before proceeding with the proposed work.
43 2. Approval by the Architect of any changes, submitted by the Contractor will be
44 considered as general only to aid the Contractor in expediting his work.
45

1 B. Contractor:

- 2 1. The Contractor engaged to execute the work included in a particular section only,
3 even though he may be technically described as a Subcontractor to the General
4 Contractor.
5 2. If the Contractor engaged to execute said work employs Sub-Contractors to perform
6 various portions of the work included under this Section, he shall be held responsible
7 for the execution of same, in full conformity with Contract Document requirements.
8 3. The Contractor shall cooperate at all times and shall be responsible for the
9 satisfactory cooperation of his Subcontractors with the other Contractors on the job
10 so that all of the various phases of the work may be properly coordinated without
11 unnecessary delays or damage to any parts of the work of any Contractor.
12

13 C. Provide:

- 14 1. Defined as requiring the furnishing and installing of the item or facility indicated,
15 complete in all respects and ready for operation unless otherwise specifically noted.
16

17 1.9 WARRANTY

- 18
19 A. The Contractor shall warranty his work against defective materials and workmanship for
20 a period of one year from date of acceptance of the job.
21
22 B. Neither the final payment nor any provisions in Contract Documents shall relieve the
23 Contractor of the responsibility for faulty materials or workmanship.
24
25 C. He shall remedy any defects due thereto, and pay for any damage to other work resulting
26 therefrom, which shall appear within a period of one year from date of substantial
27 completion.
28
29 D. The Owner shall give notice of observed defects with reasonable promptness.
30
31 E. This Guarantee shall not be construed to include the normal maintenance of the various
32 components of the system covered by these specifications.
33

34 1.10 SITE VISIT

- 35
36 A. Before submitting his proposal, each bidder shall examine all plans and specifications
37 relating to the work, shall visit the site of the project and become fully informed of the
38 extent and character of the work required.
39
40 B. No consideration will be granted for any alleged misunderstanding of the materials to be
41 furnished or the amount of work to be done, it being fully understood that the tender of
42 a proposal carries with it the agreement to all items and conditions referred to herein, or
43 indicated on the accompanying plans or required by nature of the site of which may be
44 fairly implied as essential to the execution and completion of any and all parts of the work.
45

1 1.11 SUBMITTALS

2
3 A. Submittal Procedures:

- 4 1. Bidding requirements, contract forms, conditions of the contract, Division 01 -
5 General Requirements and Division 23 apply to work of this division, in addition to
6 the following:
- 7 a. The materials, workmanship, design, and arrangement of all work installed
8 under this contract shall be subject to the review of the Architect, Engineer and
9 Owner.
 - 10 b. Where specified materials, process, or methods of construction or manufactured
11 article is specified by name or by reference to the catalog number of a
12 manufacturer, the specifications are to be used as a guide and are not intended
13 to take precedence over the basic duty and performance specified or noted on
14 the Drawings.
 - 15 c. In all cases, the Contractor shall verify the duty and available electric
16 characteristics with the specific characteristics of the equipment offered for
17 review. All component parts of each item of equipment or device shall bear the
18 manufacturer's name plate giving name of manufacturer, description, size, type,
19 serial or model number, electrical characteristics, etc., in order to facilitate
20 maintenance or replacement.
 - 21 d. If materials or equipment are installed before they have been reviewed without
22 comment by the Architect/Engineer, the Contractor shall be liable for their
23 removal and replacement at no additional expense to the Owner, if the
24 equipment does not meet the intent of the Drawings and Specifications.
 - 25 e. This Contractor shall call to the attention of the Architect/Engineer by letter or
26 on shop drawing submittals, any instance in which the shop drawings differ
27 from the requirements of the Drawings and Specifications.
 - 28 f. Data and shop drawings shall be coordinated and included in a single
29 submission. Multiple submissions are not acceptable except where prior
30 approval has been obtained from the Architect/Engineer. In such cases, a list
31 of data to be submitted later shall be included with the first submission. Failure
32 to submit shop drawings that meet the requirements of the Drawings and
33 Specifications in ample time for review shall not entitle the Contractor to an
34 extension of contract time, and no claim for extension by reason of such default
35 shall be allowed.
 - 36 g. Catalogs, pamphlets, or other documents submitted to describe items on which
37 review is being requested shall be specific and identifications in catalog,
38 pamphlets, etc., of items submitted shall be clearly made in a contrasting ink.
39 Data of a general nature shall not be acceptable. Data and shop drawings shall
40 be identified in accordance with Division 01. In addition, shop drawings shall
41 be identified by the name of the item and system and the applicable Specification
42 paragraph number.

43
44 B. Submittal Preparation:

- 45 1. Minimum of six copies are required, complete (all items submitted at one time), index
46 to each Section of Specifications requiring submittals, and include the following
47 information and action taken.

- 1 2. Organize all required data in a 3-ring black (in color) of sufficient size, hard cover
2 binder, complete with index tabs, and appropriate title of specification section.
3 a. Project Name
4 b. Date
5 c. Name and Address of Architect
6 d. Name and Address of Engineer
7 e. (See Division 01 of Specifications)
8 f. Name, Address and Telephone Number of Contractor or Sub-contractors.
9 g. Manufacturer's Name
10 h. Published ratings or capacity data
11 i. Detailed equipment drawing for fabricated items
12 j. Panel diagrams
13 k. Wiring diagrams
14 l. Installation instructions
15 m. Mechanical room layout of all HVAC equipment and other equipment drawn
16 to 1/4" = 1'-0" scale and dimensioned.
17 n. Other pertinent data
18 o. All required submittals and data, bound together, submitted at one time.
19

20 C. Submittal Organization:

- 21 1. Organize all required data in a 3-ring black (in color) of sufficient size, hard cover
22 binder, complete with index tabs, and appropriate title of specification section.
23 Submit the following sections:
24 23 00 10 Basic Mechanical Requirements
25 23 05 32 Roof Curbs
26 23 05 34 Isolation Devices
27 23 05 54 Mechanical Identification
28 23 07 01 Duct And Grille Insulation
29 23 08 01 Air Balance & System Testing
30 23 09 24 Energy Management Control System (EMCS) BACnet
31 23 31 01 Ductwork
32 23 33 34 Access Doors
33 23 34 01 HVAC Fans
34 23 36 17 Variable Air Volume
35 23 37 14 Air Distribution Devices
36 2. Provide a cover sheet and an index sheet listing all items submitted. The second and
37 third sheet shall be blank for stamping of submittals.
38 3. The successful review rendered on shop drawings shall not be considered as a
39 guarantee of building conditions. Where drawings have been successfully reviewed,
40 said review does not mean that the drawings have been checked in detail and does
41 not in any way relieve the Contractor from the responsibility, nor the necessity of
42 furnishing the material or performing the work as required by the Drawings and
43 Specifications.
44 4. All equipment and materials to be furnished under this Division of these
45 Specifications shall be as manufactured by the manufacturer(s) listed on the
46 Drawings, herein specified, or accepted by addendum.

- 1 5. The Engineer's review of submittals is only for confirmation of adherence to design
2 of project and does not relieve the Contractor of responsibility of furnishing all
3 material for a complete working system and equivalent products as specified.
- 4 6. The Mechanical Contractor shall submit a schematic of all control wiring for all
5 equipment. This can be a manufacturer's diagram. A copy of the control schematic
6 shall be submitted to the Electrical Contractor at the same time for his comments.
7 No submittal will be approved until all control diagrams are submitted.
- 8 7. Mechanical Contractor and Plumbing Contractor shall submit 1/4 inch per foot shop
9 drawing(s) showing all piping, ductwork and equipment shown by the plans and
10 specifications. The drawing(s) shall be coordinated with structural drawings and all
11 other trades especially the fire sprinkler (if required) and electrical. A reproducible
12 drawing shall be corrected to "as built" and submitted to Owner at the termination
13 of the project. If contractor has obtained an electronic copy of construction
14 documents merely reproducing these drawings will not be acceptable.
- 15 8. Equipment rooms and other complex areas shall be drawn at a larger scale (1/2 inch
16 per foot or greater) as required to indicate complete layout.

18 1.12 PROJECT RECORD DOCUMENTS

- 19 A. The Contractor shall keep a set of plans on the job, noting daily all changes made in
20 connection with the final installation including exact dimensioned locations of all new
21 and uncovered existing utility piping outside the building.
- 22 B. Upon submitting his request for final payment, he shall turn over to the
23 Architect/Engineer, for subsequent transmittal to the Owner, a clean, neatly marked set
24 of reproducible plans showing "as installed" work and an electronic file with changes of
25 materials.
- 26 C. In addition to the above, the Contractor shall accumulate during the job's progress the
27 following data, in duplication (2 each), prepared in 3 ring binders of sufficient size, black
28 in color, neat in appearance, and turned over to the Architect/Engineer for checking and
29 subsequent delivery to the Owner:
 - 30 1. All warranties, guarantees and manufacturer's directions on equipment and material
31 covered by the Contract.
 - 32 2. Approved fixture brochures.
 - 33 3. Copies of approved shop drawings.
 - 34 4. Set of operating instructions. Operating instructions shall also include recommended
35 maintenance and seasonal changeover procedures.
 - 36 5. Any and all other data and/or plans required during construction.
 - 37 6. Repair parts lists of all major items and equipment including name, address and
38 telephone number of local supplier or agent.
- 39 D. The first page, or pages, shall have the names, addresses, and telephone numbers of the
40 following:
 - 41 1. General Contractor and all sub-contractors.
 - 42 2. Major Equipment Suppliers.

1 1.13 TRAINING

- 2
- 3 A. Upon completion of the work and at a time designated by the Owner's representative,
- 4 provide a formal training session for the Owner's operating personnel to include location,
- 5 operation, and maintenance of all mechanical equipment and systems, some sections have
- 6 further instructions.
- 7
- 8 B. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects
- 9 that will be covered. Submit the outline for review by the Owner's representative.
- 10
- 11 C. At the conclusion of the instruction, obtain the signatures of the attendees on each copy
- 12 of the outline to signify that they have a proper understanding of the operation and
- 13 maintenance of the system. Submit the signed outlines to the Owner's representative and
- 14 Engineer as a condition of final acceptance.
- 15

16 1.14 PLANS AND SPECIFICATIONS

- 17
- 18 A. The plans show diagrammatically the locations of the various lines, ducts, conduits,
- 19 fixtures, and equipment and the method of connecting and controlling them.
- 20
- 21 B. It is not intended to show every connection in detail and all fittings required for a
- 22 complete system.
- 23
- 24 C. The systems shall include but are not limited to the items shown on the plans.
- 25
- 26 D. Exact locations of these items shall be determined by reference to the general plans and
- 27 measurements of the building and in cooperation with other contractors, and in all cases,
- 28 shall be subject to the approval of the Architect/Engineer.
- 29
- 30 E. The Architect/Engineer reserves the right to make any reasonable change in the location
- 31 of any part of this work without additional cost to the Owner.
- 32
- 33 F. Contractor, subcontractor, vendors and suppliers are required to waive subrogation
- 34 against Owner and Engineer.
- 35

36 1.15 UTILITIES, LOCATIONS, AND ELEVATIONS

- 37
- 38 A. Locations and elevations of the various utilities within the scope of this work have been
- 39 obtained from the City and/or other substantially reliable sources and are offered
- 40 separately from the Contract documents, as a general guide only, without guarantees as
- 41 to accuracy.
- 42
- 43 B. The Contractor shall examine the site, shall verify to his own satisfaction the locations,
- 44 elevations and availability of all utilities and services required, and shall adequately inform
- 45 himself as to their relation to the work; the submission of bids shall be deemed evidence
- 46 thereof.
- 47

- 1 C. The Contractor shall coordinate all services with the Utility Companies during
2 construction, coordinate changes made by Utility Companies to the design of project, and
3 coordinate with the Owner, Architect/Engineer, and Utility the scheduling of any
4 shutdowns or delays that may occur in providing service.
5
6 D. The Contractor shall verify location, conduct all necessary tests, inspections, coordinate
7 with Owner's representatives and utilities, and check for existing underground utilities
8 and lines before ditching.
9
10 E. The Contractor shall be responsible for repair of any cut or damaged lines or utilities he
11 uncovers. There are lines and utilities not shown on any plans.
12

13 1.16 SUBSTITUTION OF PRODUCTS
14

- 15 A. Substitution of products specified herein will be considered only when a complete list of
16 proposed alternative equipment is submitted to the Engineer in writing, supported by
17 adequate technical and cost data. This includes a complete description of the proposed
18 substitution, drawings, catalog cuts, performance data, test data, or any other data or
19 information necessary for evaluation.
20
21 B. All proposed substitutions and data must be received by the Engineer no less than ten
22 working days prior to the schedule date for opening of bids.
23
24 C. The Engineer will consider all such submittals and the Architect will issue an addendum
25 listing items which the Engineer considers acceptable. Only such items as specified or
26 approved as acceptable will be installed on this project.
27
28 D. Manufacturers' names are listed herein and on the plans to establish a standard of quality
29 and design. Where a manufacturer's name is mentioned, products of other manufacturers
30 will be acceptable, if in the opinion of the Engineer, the substitute material is of equivalent
31 quality or better than that of the material specified.
32
33 E. The Contractor's Bid represents that the bid price is based solely upon the materials and
34 equipment described in the Bid Documents (including addenda, if any) and that he
35 contemplates no substitutions or extras.
36
37 F. Requests for substitution are understood to mean that the Contractor:
38 1. Has personally investigated the proposed substitution and determined that it is equal
39 or superior in all respects to that specified.
40 2. Will provide the same guarantee for the substitution that he would for that specified.
41 3. Will, at no cost to the Owner, replace the substitute item with the specified product
42 if the substitute item fails to perform satisfactorily.
43 4. After Award of the Contract, substitutions will be considered only under one or more
44 of the following circumstances:
45 a. The substitution is required for compliance with subsequent interpretations of
46 code or insurance requirements.
47 b. The specified product is unavailable through no fault of the Contractor.

- 1 c. The manufacturer refuses to warranty the specified products as required.
2 d. Subsequent information that the specified product is unable to perform properly
3 or to fit in the designated space.
4 e. In the Engineer's sole judgment, the substitution would be in the Owner's best
5 interest.
6 5. Revisions to the mechanical system shall be under the supervision of the Engineer
7 at a standard hourly rate charged by the Engineer and shall be paid by the Contractor
8 originating the changes.
9

10 1.17 PROTECTION OF EQUIPMENT AND MATERIALS
11

- 12 A. The Contractor shall take such precautions as may be necessary to properly protect his
13 apparatus from damage.
14
15 B. This shall include the creation of all required temporary shelters to adequately protect any
16 apparatus above the floor of the construction and the covering of apparatus in the
17 completed building with tarpaulins or other protective covering.
18
19 C. Failure to comply with the above to the satisfaction of the Owner's inspector will be
20 sufficient cause for the rejection of the equipment in question and its complete
21 replacement by this Contractor.
22
23 D. All apparatus shall be cribbed up from the floor or ground by the Contractor and covered
24 with tarpaulins or other protective covering where necessary or directed.
25

26 1.18 FINAL INSPECTION
27

- 28 A. It shall be the duty of this Contractor to make a careful inspection trip of the entire
29 project, assuring himself that the work on the project is ready for final acceptance before
30 calling upon the Architect/Engineer to make a final inspection.
31
32 B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary
33 bonds, warranties, receipts, affidavits, etc., called for in the various articles of these
34 specifications, prepared and signed in advance, together with a letter of transmittal, listing
35 each paper included, and shall deliver the same to the Architect/Engineer at or before
36 the time of said final inspection. The Contractor is cautioned to check over each bond,
37 receipt, etc., before preparing for submission to verify that the terms check with the
38 requirements of the specifications.
39

40 1.19 ASBESTOS
41

- 42 A. No asbestos or asbestos containing materials shall be permitted in this project.
43

44 1.20 CUTTING AND PATCHING
45

- 46 A. All Subcontractors shall notify the General Contractor sufficiently ahead of construction
47 of any floors, walls, ceiling, roof, etc., of any openings that will be required for his work.

- 1
2 B. He shall see that all sleeves required for his work are set at proper times so as to avoid
3 delay of the job.
4
5 C. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper
6 installation of the work under this Contract shall be done at the Subcontractor's expense
7 in a neat and workmanlike manner, and as approved by the Architect/Engineer.
8
9 D. No joists, beams, girders or columns shall be cut by any Contractor without first obtaining
10 written permission of the Architect/Engineer.
11
12 E. Patching of openings and/or alterations shall be provided by the General Contractor.
13
14 F. All openings in firewalls and floors, such as thimbles, shall be completely sealed after
15 installation for a completely airtight installation. Sealing material shall be non-combustible
16 and UL approved. The installed sealing assembly shall not cause the fire rating of the
17 penetrated structure to be decreased.
18
19 G. All openings in exterior walls shall be sealed watertight.

20
21 1.21 IDENTIFICATION

- 22
23 A. Refer to Section 23 05 54.
24

25 1.22 MANUFACTURER'S INSTRUCTIONS

- 26
27 A. All equipment and devices shall be installed in accordance with these plans and
28 specifications, manufacturer's instructions and applicable codes.
29
30 B. Where specifications call for installation of a product to be in accordance with
31 manufacturer's instructions and/or where manufacturer's instructions are required for
32 installation of a product, it shall be the contractor's responsibility to obtain the necessary
33 applicable manufacturer's instructions and install the product in accordance with the
34 manufacturer's instructions.
35
36 C. It shall be the Contractor's responsibility to install all equipment, materials, and devices
37 shown on the plans and as called out in these specifications even if manufacturer's
38 instructions are absolutely unattainable.
39

40 1.23 RELATED WORK

- 41
42 A. The various specification sections for this division may or may not include related work
43 listings.
44
45 B. All related work shall be coordinated and provided by the Mechanical Contractor
46 regardless whether specifically identified or not.
47

1 1.24 ELECTRICAL WIRING AND EQUIPMENT FOR MECHANICAL SYSTEMS

- 2
- 3 A. All wiring, conduit, boxes, equipment (controls, thermostats, relays, contactors, motor
- 4 starters, heaters, switches) and any other control devices or equipment required to form
- 5 a complete and properly operating system, shall be the responsibility of the Mechanical
- 6 Contractor.
- 7
- 8 B. The Electrical Contractor shall only provide line voltage (including hook-up) to all
- 9 mechanical equipment.
- 10
- 11 C. All mechanical controls and devices shall be low voltage unless otherwise noted or shown
- 12 on the plans. Where line voltage controls or devices are noted, the Contractor shall
- 13 provide complete wiring diagrams (approved by the Engineer) to the Electrical
- 14 Contractor prior to final hook-up.
- 15
- 16 D. All electrical resistance heating elements which are scheduled to be served by three-phase
- 17 electrical power shall impose an equal electrical load on all phases. Electrical resistance
- 18 elements which are not balanced over all three phases are not acceptable.
- 19
- 20 E. The Mechanical and Electrical plans are based on the equipment and devices scheduled
- 21 as shown on the plans or as called for in the specifications. Should any mechanical
- 22 equipment or device be changed or approved from those which are shown or noted, all
- 23 electrical and/or mechanical changes shall be made at the expense of the trade or
- 24 contractor initiating the change with no expense to the Owner, Architect, Engineer or
- 25 their representatives.
- 26
- 27 F. All wiring provided by this Contractor shall be installed in a workmanlike manner using
- 28 tie wraps, labels, anchors and etc. Loose wiring is not acceptable.
- 29
- 30 G. All conduit and boxes required in all walls for control purposes (thermostats, etc.) shall
- 31 be provided by electrical contractor. All conduit required in attic, clear spaces, or on roof
- 32 shall be by mechanical contractor.
- 33

34 1.25 FIRE ALARM SAFETY CONTROL FUNCTIONS

- 35
- 36 A. Fire Alarm Safety Control Functions, which may include the operation of fire alarm
- 37 Control Relays [CR] associated with duct mounted smoke detector [D]/air handler shut
- 38 down, high volume low speed (HVLS) fan shut down, fire door hold-back and release,
- 39 smoke fire damper motor control, et cetera, shall be initiated via Control Relays which
- 40 shall be de-energized under fire alarm conditions. These Control Relays shall be provided
- 41 and mounted by the Fire Alarm Contractor and located within three feet of the unit.
- 42 These Control Relays shall be controlled by a fail-safe Fire Safety Control Function
- 43 circuit. For each controlled device the contractor providing the device shall wire it
- 44 internally for fail-safe shut-down and provide a labeled 3' coil of cable outside the unit to
- 45 allow the fire alarm contractor to make final connection to the Common and N.O. or
- 46 N.C. dry contacts on the fire alarm SPDT Control Relay. Each Fire Safety Control
- 47 Function circuit controlled device shall be configured such that when the fire alarm

1 system safety control circuit is re-energized, by the fire alarm control panel, the device
2 shall return to normal operation (e.g. be ready to re-start) without a need for manual or
3 environmental control system intervention.
4

5 1.26 DEMOLITION AND REMODEL
6

- 7 A. It shall be the responsibility of this Contractor to see that all demolition and remodeling
8 work involving his trade is accomplished in a manner and completeness to provide the
9 appearance of new construction work.
10
11 B. Abandoned air conditioning units shall be removed and disposed of off site in a legal
12 manner.
13
14 C. Any usable equipment and/or structure damaged during demolition and remodel work
15 shall be replaced.
16
17 D. All abandoned and/or otherwise unused piping shall be securely capped using materials
18 of the same composition as the original piping.
19
20 E. No exposed piping and/or other materials will be permitted in the finished job.
21
22 F. Any abandoned piping which penetrates the slab in an exposed area shall be securely
23 capped below the slab.
24

25 1.27 OPERATION PRIOR TO COMPLETION
26

- 27 A. When any piece of mechanical or electrical equipment is operable and the Contractor
28 needs to operate the equipment, he may do so providing that he properly supervises the
29 operation.
30
31 B. The warranty period shall, however, not commence until such time as the equipment is
32 operated for the beneficial use of the Owner.
33
34 C. Regardless of whether or not the equipment has or has not been operated, the Contractor
35 shall properly clean the equipment, install clean filter media, properly adjust and complete
36 all punch list items before final acceptance by the Owner.
37
38 D. The date of acceptance and the start of the warranty may not be the same date.
39

40 1.28 SAFETY GUARDS
41

- 42 A. Contractor shall furnish and install all safety guards required. All belt driven equipment,
43 projecting shafts and other rotating parts shall be enclosed or adequately guarded.
44

1 1.29 FLAME SPREAD PROPERTIES OF MATERIALS

- 2
- 3 A. All materials and adhesives used for air conditioning filters, acoustical lining and
- 4 insulation shall conform to NFPA and UL life and flame spread properties of materials.
- 5
- 6 B. The composite classifications shall not exceed 25 for a flame spread rating and 50 for a
- 7 smoke developed rating as listed for the basic material, the finishes, adhesives, etc.,
- 8 specified for each system and shall be such when completely assembled.
- 9

10 1.30 FILTER ASSEMBLIES

- 11
- 12 A. All filter housings and assemblies shall be factory built and supplied with the unit.
- 13
- 14 B. Access doors (panels) which must be opened to change the air filters shall be labeled
- 15 "Filter Access" and the number and size of required filters shall be identified.
- 16
- 17 C. No piping conduit etc. shall be installed in front of this access door.
- 18
- 19 D. Install clean filters prior to substantial completion.
- 20
- 21 E. All air handlers shall have filters installed upstream of all coils.
- 22

23 1.31 LEAD MATERIALS

- 24
- 25 A. No lead or lead containing materials shall be allowed in any domestic or potable water
- 26 supply piping, valves, fixtures, components, equipment or any other item.
- 27

28 1.32 REFRIGERANTS

- 29
- 30 A. Chlorofluorocarbons (CFCs) shall not be allowed in any equipment on this project.
- 31
- 32 B. Comply with ASHRAE Standards 15 and 34.
- 33

34 1.33 REFRIGERANT RECOVERY AND RECYCLE

- 35
- 36 A. Refrigerants shall not be released to the environment.
- 37
- 38 B. Contractor shall provide recovery and recycle equipment that has been certified by the
- 39 Electrical Testing Laboratories or Underwriters Laboratories.
- 40
- 41 C. Contractor shall also provide properly trained and certified (in accordance with EPA)
- 42 personnel for refrigerant work during installation, demolition, start-up, servicing, etc.
- 43

44 1.34 ACCESS CLEARANCE

- 45
- 46 A. Proper access to all installed equipment shall be provided. The Mechanical Contractor
- 47 shall label all points of access immediately upon installation with a marker pen.

- 1
2 B. A minimum of 3 feet shall be maintained in front of all access points.
3
4 C. If another trade violates this space, the Mechanical Contractor shall immediately notify
5 the General Contractor to correct this condition.
6
7 D. When equipment is installed above lay-in ceiling the Mechanical Contractor shall
8 coordinate with the Ceiling Contractor to provide access without removing part of T-bar
9 ceiling.
10
11 E. No speakers, lights, fire alarm equipment, etc. shall be installed in lay-in ceiling tiles where
12 access is to be gained.
13

14
15 PART 2 PRODUCTS

- 16
17 A. Not Applicable
18
19

20 PART 3 EXECUTION

21
22 3.1 TESTING

- 23
24 A. After all mechanical systems have been completed and put into operation, subject each
25 system to an operating test under design conditions to ensure proper sequence and
26 operation throughout the range of operation regardless of the season the contractor shall
27 test all HVAC equipment in both heating and cooling modes.
28
29 B. Each and every phase of the new air conditioning, heating and ventilating systems shall
30 be operated separately, or in conjunction with the other, for a period of time, to
31 demonstrate to the satisfaction of the Architect/Engineer the ability of the equipment to
32 meet the capacity and performance requirements while maintaining design conditions in
33 accordance with the true intent and purpose of these specifications.
34
35 C. Previous to such performance tests, the Contractor shall have set all valves, dampers,
36 motors, controllers, thermostats, etc., and shall have the system operating and maintaining
37 design temperatures, humidity and air circulation throughout all areas of the building.
38
39 D. Make adjustments as required to ensure proper functioning of all systems.
40
41 E. Special tests on individual systems are specified under individual sections.
42
43 F. See Section 23 08 01 for air balancing.
44

1 3.2 ADDITIONAL MATERIALS

2

3 A. All cost to provide and install 6 additional (nominal size 20 x 16) smoke fire dampers, all
4 additional labor, overhead, materials, etc. Other sizes will be adjusted accordingly.

5

6

END OF SECTION

1 SECTION 23 05 32

2
3 ROOF CURBS

4
5
6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 1 Specifications and Section 23 00 10, apply to this Section.
12

13 1.2 SECTION INCLUDES

- 14
15 A. Roof curbs for rooftop packaged HVAC units, exhaust fans, and supply fans.
16

17 1.3 RELATED SECTIONS

- 18
19 A. Section 23 00 10 - Basic Mechanical Requirements
20
21 B. Section 23 34 01 - HVAC Fans
22

23 1.4 REFERENCES

- 24
25 A. ASTM D4586 - Fibrated Asphalt Roof Cement
26

27 1.5 SUBMITTALS

- 28
29 A. Product Data:
30 1. Submit manufacturer's product data sheets, including installation instructions, in
31 accordance with Section 23 00 10, General Conditions, and Division 01.
32 2. Submit with equipment that curb is used with.
33
34 B. Shop Drawings:
35 1. Submit for prefabricated equipment supports in accordance with Section 23 00 10,
36 General Conditions and Division 1.
37
38

39 PART 2 PRODUCTS

40
41 2.1 ROOF CURBS FOR EXHAUST AND SUPPLY FANS

- 42
43 A. Insulated and Non-insulated Roof Decks:
44 1. Type:
45 a. Prefabricated insulated curb.
46 2. Material:
47 a. Minimum 18 gauge prime galvanized steel.

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 - 45
3. Construction:
 - a. Designed to support weight of the exhaust or supply fan.
 - b. Factory-welded or hinged corners.
 - c. Internally reinforced.
 - d. Factory-installed 1" x 4" treated wood nailers fastened from the underside with TEK screws.
 - e. Top of all curbs to be level with pitch built into the curb when deck slopes ¼ inch per foot or greater.
 4. Fiberglass Insulation:
 - a. Thickness:
 - (1) 1½ inches
 - b. Density:
 - (1) 3 lbs.
 - c. Factory installed.
 5. Height:
 - a. 18 inches above the roof deck or as shown on the plans.
 6. Manufacturer:
 - a. ThyCurb
 - b. Rooftop Systems
 - c. Fan Manufacturer
- B. Roof Curbs For Single-Ply Roofing:
1. Type:
 - a. Prefabricated insulated curb.
 2. Material:
 - a. Minimum 18 gauge prime galvanized steel.
 3. Construction:
 - a. Designed to support weight of the exhaust or supply fan.
 - b. Welded corners and seams joined by continuous welds.
 - c. Internally reinforced.
 - d. Factory-installed 2 x 4 treated wood nailers fastened from the underside with TEK screws.
 - e. Top of all curbs to be level with pitch built into the curb when deck slopes ¼ inch per foot or greater.
 4. Fiberglass Insulation:
 - a. Thickness:
 - (1) 1½ inches
 - b. Density:
 - (1) 3 lbs.
 - c. Factory installed.
 - d. Height:
 - (1) 16 inches above roof deck or as shown on the plans.
 - e. Manufacturer:
 - (1) ThyCurb TC-3

1 C. Roof Curbs for Metal Roofs:

2 1. Type:

- 3 a. Prefabricated insulated curb

4 2. Material:

- 5 a. Same as roof material

6 3. Construction:

- 7 a. Designed to support weight of the exhaust or supply fan.

- 8 b. Welded corners and seams joined by continuous welds. Add Cricket if curb is
9 wider than 16-inches.

- 10 c. Internally reinforced.

- 11 d. Factory-installed 2 x 4 treated wood nailers fastened from the underside with
12 TEK screws.

- 13 e. Top of all curbs to be level with pitch built into the curb when deck slopes $\frac{1}{4}$
14 inch per foot or greater.

15 4. Fiberglass Insulation:

- 16 a. Thickness:

17 (1) 1½ inches

- 18 b. Density:

19 (1) 3 lbs.

- 20 c. Factory installed.

- 21 d. Height:

22 (1) 16 inches above roof deck or as shown on the plans.

- 23 e. Manufacturer:

24 (1) By Roof System or ThyCurb
25

26 2.2 RELATED MATERIALS

27
28 A. Nails:

29 1. Type:

- 30 a. Stainless steel, flathead, wire, barbed, slating type.

31 2. Washers:

- 32 a. Neoprene.
33

34 B. Flashing Cement:

35 1. ASTM D4586 - Type 1

36 2. Asbestos free
37
38

39 PART 3 EXECUTION

40
41 3.1 EXAMINATION

- 42
43 A. Verify that substrates are smooth and clean to extent needed for work.
44

1 3.2 INSTALLATION

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A. General:

1. Install prefabricated roof curbs beneath new exhaust fans, supply fans, make-up air units, rooftop heating/cooling units, other mechanical equipment, etc.
2. Install work watertight, without waves, warps, buckles, fastening stresses or distortion.
3. Allow for expansion and contraction.
4. Coat contact surfaces of dissimilar metals with zinc chromate paint.
5. Set LEVEL and square on structural framing beneath roof deck.
6. Securely fasten curb flanges with bolts through flanges.
7. Seal bolt heads with flashing cement.

B. Roof Curb Heights:

1. Verify roofing insulation thickness where curbs are to be installed. Coordinate height above roof to meet roofing manufacturer's specifications.
2. Minimum Height:
 - a. 12-inches above finished roof.

END OF SECTION

1 SECTION 23 05 34

2
3 ISOLATION DEVICES

4
5
6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 1 Specifications and Section 23 00 10, apply to this Section.
12

13 1.2 SECTION INCLUDES

- 14 A. Isolation pads
15
16 B. Concrete bases
17
18 C. Expansion joints
19
20 D. Other supports
21
22

23 1.3 RELATED SECTIONS

- 24 A. Section 23 00 10 - Basic Mechanical Requirements
25
26 B. Section 23 09 24 - Control System
27
28 C. Section 23 31 01 - Ductwork
29
30 D. Section 23 34 01 - HVAC Fans
31
32

33 1.4 SUBMITTALS

- 34 A. Product Data:
35 1. Provide submittal data on all items specified in this section in accordance with
36 Section 23 00 90, General Conditions, and Division 1.
37 2. Submit shop drawings and catalog data with locations of use.
38
39

40 1.5 REFERENCES

- 41 A. Refer to Section 23 00 10 for complete names of references identified in this section.
42
43 B. SMACNA 1995 Edition
44
45 C. ASHRAE – American Society of Heating, Refrigeration and Air Conditioning
46 Engineers
47

1 1.6 QUALITY ASSURANCE

2
3 A. Isolation devices must be provided by a company whose sole business is to provide
4 isolation equipment.

5
6 B. All equipment and materials to be installed in workmanlike manner by experienced
7 mechanics and as recommended by the manufacturers.

8
9 C. Design Data: Complete design of isolation equipment including confirmation that no
10 noise will be transmitted to structure of building.

11
12
13 PART 2 - PRODUCTS

14
15 2.1 GENERAL

16
17 A. Provide isolation and support devices as required for all mechanical equipment.

18
19 2.2 MANUFACTURERS

20
21 A. Amber/Booth

22
23 B. Kenetics

24
25 C. Korfund Vibration Mountings

26
27 D. Mason

28
29 E. Peabody

30
31 F. Vibro Acoustics

32
33 2.3 FLEXIBLE DUCT CONNECTIONS

34
35 A. Use "Ventglas" fabric, fireproof, waterproof, and mildew resistant, approximately 30
36 ounces per square yard.

37
38 B. Comply with SMACNA standards.

39
40
41 PART 3 - EXECUTION

42
43 3.1 INSTALLATION

44
45 A. Install isolation pads between floor and equipment pads according to manufacturer's
46 recommendations and approved shop drawings.

- 1 B. Install flexible duct connections where ducts connect to fans or air handling units.
- 2
- 3 C. All joints to be airtight.
- 4
- 5 D. Provide a minimum of 1/2" slack in connections, and a minimum of 2½" distance
- 6 between the edges of ducts.
- 7
- 8 E. Comply with recommendations of ASHRAE for the selection and application of
- 9 vibration materials and units.

10
11

END OF SECTION

1 SECTION 23 05 54

2
3 MECHANICAL IDENTIFICATION

4
5
6 PART 1 GENERAL

7
8 1.1 RELATED DOCUMENTS

- 9
10 A. Drawings and general provisions of Contract, including General and Supplementary
11 Conditions, Division 01 Specifications and Section 23 00 10, apply to this Section.
12

13 1.2 SECTION INCLUDES

- 14
15 A. Identification required for mechanical systems.
16
17 B. Code required identification not shown on plans nor specified herein shall be provided.
18

19 1.3 RELATED SECTIONS

- 20
21 A. Section 23 00 10 - Basic Mechanical Requirements
22
23 B. Section 22 05 30 - Pipe and Pipe Fittings - General
24
25 C. Section 23 34 01 - HVAC Fans
26

27 1.4 SUBMITTALS

- 28
29 A. Provide submittal data on all items specified in this section in accordance with
30 Specification Section 23 00 10, General Conditions, and Division 01.
31
32 B. Submit wording of nameplates with submittals.
33
34 C. Submit list of all products incorporated in this section.
35

36 1.5 REFERENCES

- 37
38 A. Comply with ANSI A13.1
39
40 B. USAS Code B31.8
41
42 C. NTSB-PSS-73-1
43
44 D. AGA
45
46 E. API
47

- 1 1.6 DESCRIPTION OF WORK
2
3 A. Provide signs for following equipment identification:
4 1. VAV boxes
5 2. Boilers/Water Heaters
6 3. Condensing Units
7 4. Duct Dampers
8 5. Filter Sizes for Air Handlers
9 6. Fire Dampers
10 7. Heat Exchangers
11 8. Outside Air Units
12 9. Piping
13 10. Pumps
14 11. Starters
15 12. Supply/Exhaust Fans
16 13. Valves
17
18

19 PART 2 PRODUCTS

20
21 2.1 MANUFACTURERS

- 22
23 A. Seton
24
25 B. Brady
26

27 2.2 EQUIPMENT LABELS

- 28
29 A. Type: Engraving-Stock, melamine plastic laminate, 3 layer.
30 1. Thickness:
31 a. Less than 25 square inches: 1/16 inch
32 b. 25 square inches or more: 1/8 inch
33
34 B. Color:
35 1. Black
36
37 C. Conform to FS L-P-287
38

39 2.3 LETTERING

- 40
41 A. Style:
42 1. Engraved standard print, unless otherwise indicated.
43
44 B. Size:
45 1. 3/16 inch to 1/4 inch
46

- 1 C. Color:
2 1. White letters, black background
3

4 2.4 SIGN INFORMATION
5

- 6 A. HVAC Equipment:
7 1. Unit mark from Drawings/Owner
8 2. Voltage - Phase
9 3. Manufacturer and Model Number
10

11 2.5 NAMEPLATE FASTENERS
12

- 13 A. Securely attach nameplates to equipment with noncorroding stainless steel screws.
14
15 B. Non-corroding pop rivets are acceptable.
16
17 C. Stick-ons or adhesives will not be allowed.
18

19 2.6 PIPING AND CONTROL DIAGRAM SIGNS
20

- 21 A. Material: 1/4-inch acrylic cover and backing screwed together with brass screw/bolts.
22 1. Size:
23 a. Minimum: 12" x 17"
24 b. Maximum: 24" x 36"
25
26 B. Provide a diagram in each mechanical room similar to the diagrams shown on the plans,
27 and/or as required for the area served.
28

29 2.7 IDENTIFICATION OF PRODUCTS
30

- 31 A. Provide pipe markers with the following features.
32 1. Letters from 1/2" to 3-1/2"; size letters to afford readability from the appropriate
33 viewing position.
34 2. Repeated and reversed words for viewing from 360° around pipe.
35 3. Self-clinging, coiled markers that snap into place around pipe and do not require any
36 other securement.
37 4. Integral directional arrows.
38
39 B. Letters on Field:
40 1. Identify the specific material conveyed, e.g., "Domestic Cold Water", "Sprinkler",
41 etc.
42
43 C. Model:
44 1. Less than 3/4":
45 a. Tags, same as Paragraph: Piping System Devices, color codes for hazard.
46 2. 3/4" up to 6"; Seton Setmark SNA snap-on.
47 3. Over 6"; Seton Setmark STR strap-on, with stainless steel spring straps.

- 1 L. Model:
- 2 1. Metallic Piping System:
- 3 a. Seton Polyethylene Tape.
- 4 2. Non-Metallic Piping System:
- 5 a. Seton Metallic Detection Tape.
- 6
- 7 M. Underground Gas Piping:
- 8 1. Attach No. 18-gauge copper tracer wire to the piping and terminate above grade at
- 9 each end.
- 10
- 11 N. Pipeline Markers for Pipe Beneath Pavement and Slabs:
- 12 1. Minimum 2" round, square, or octagonal, same as specified in Subparagraph: Piping
- 13 System Devices.
- 14
- 15 O. Attachment:
- 16 1. 1-1/2" screw, bolted to tag as anchor.
- 17 2. Anchor Setting Compound:
- 18 a. Epoxy or epoxy grout, compatible with the pavement.
- 19

20

21 PART 3 EXECUTION

22

23 3.1 GENERAL

24

- 25 A. Contractor shall verify room numbers with Owner/Engineer before nameplates are
- 26 fabricated.
- 27
- 28 B. The following shall be permanently and clearly identified:
- 29 1. Each air handler, condensing unit, compressor, exhaust fan, and pump.
- 30 2. Each zone duct, outside air duct, and return air duct whose duty is not immediately
- 31 apparent.
- 32 3. Each valve whose service and/or duty is not immediately apparent.
- 33

34 3.2 INSTALLATION

35

- 36 A. Install signs on non-removable panels. Attach to equipment with pop rivets or stainless
- 37 steel screws.
- 38
- 39 B. Mount in an easily visible location.
- 40
- 41 C. All labeling identification shall conform to final room numbers. Coordinate with General
- 42 Contractor, Architect and Owner to secure construction room numbers.
- 43
- 44 D. Provide all additional signage required by local authority at no cost to the Owner.
- 45
- 46 E. Provide filter sizes and quantity on all air handlers.
- 47

- 1 F. Complete installation in accordance with ANSI A13.1 and manufacturer's installation
2 instructions and with the Drawings. Fasten each unit securely in place with stainless
3 steel screws.
4
- 5 G. Equipment Labeling:
6 1. Install on scheduled items of equipment, including the following:
7 a. Water heaters
8 b. Air conditioning equipment
9 c. Pumps
10 d. Control panels and major control components
11 e. Other items of equipment
12 f. Include Mark Number and descriptive name from Drawing and Specification
13 schedules
14 g. Attach with corrosion resistant, stainless steel screws or pop rivets
15 h. Install 1/2" diameter adhesive marker (color to be approved by Architect), and
16 apply to T-bar below any mechanical equipment and fire dampers above lay-in
17 ceiling.
18
- 19 H. Piping System Color Coding:
20 1. Designate for painter the following:
21 a. Types of piping services
22 b. Direction of flow
23 c. Other information required for proper identification.
24
- 25 I. Surfaces to be Painted:
26 1. Bare piping
27 2. Insulation covering of insulated piping
28
- 29 J. Paint according to the following schedule:
30

System	Pastel Color
Gas Piping on Roof	Black or selected by Owner/Architect

31
32
33
- 34 K. Piping System Devices (Valves, Thermometers, Pressure Gages, etc.):
35 1. Identify with the following information:
36 a. System
37 b. Device number
38 c. Device Function
39
- 40 L. Device Chart:
41 1. Key devices to device chart
42 2. Give complete description of device function and system.
43
- 44 M. Key devices to drawings as follows:
45 1. Floor plans
46 2. Schematic drawings of piping systems
47

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N. Underground Warning Tapes:

1. Tape Widths:

Piping Burial	Depth	Tape Width
10"	2"	
20"	3"	
27"	6"	
30"	9"	
40"	12"	
50" or more	18"	

O. Recommended Tape Bury Depth:

1. Minimum Depth:

a. 6".

2. Distance Between Pipe and Tape:

a. Minimum 12".

b. Maximum Depth: 12".

3. Tie tape to pipe where pipe leaves the ground.

P. Pipeline Markers for Pipe Beneath Pavement and Slabs.

1. Location:

a. Accuracy:

(1) Plus or minus 6" from piping centerline.

b. Flat Edge Pavement and Slabs:

(1) Set within 6" of pavement or slab edge.

c. Concrete Curbs:

(1) Set in top of curb.

d. Spacing:

(1) Each change in direction, each edge of pavement or slab, maximum spacing of 100'.

Q. Legend:

1. Same as tags plus an engraved or stamped line; set marker with line parallel to buried line.

R. Attachment:

1. Drill hole for anchor bolt, full depth of bolt plus 1/2"; set full tag and bolt in epoxy, flush with pavement or slab.

END OF SECTION

SECTION 23 07 01

DUCT AND GRILLE INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. External duct insulation
- B. Internal duct liner

1.3 RELATED SECTIONS

- A. Section 22 07 20 - Piping Insulation
- B. Section 23 00 10 - Basic Mechanical Requirements
- C. Section 23 31 01 - Ductwork

1.4 SUBMITTALS

- A. Product Data:
 - 1. Provide submittal data on all equipment specified in this section in accordance with Section 23 00 10, General Conditions, and Division 01.
 - 2. Submit product data indicating typical catalog of information.
 - 3. Submit product data sheets indicating dimensions, general assembly, and ratings.
 - 4. Submit manufacturer's installation instructions.
 - 5. Submit kitchen exhaust duct wrap to City for approval prior to submitting to Engineer.

1.5 REFERENCES

- A. Refer to Section 23 00 10 for complete names of references identified in this section.
 - 1. ASTM E84 - Standard test for surface burning characteristics of building materials.
 - 2. NFPA 221 - Fire walls and fire barrier walls.
 - 3. NFPA 255 - Surface burning characteristics of building materials.
 - 4. NFPA 96 - Ventilation control and fire protection of commercial cooking operations.
 - 5. UL 723 - Test for surface burning characteristics of building materials.
 - 6. ASTM C553 - Standard specification for mineral fiber blanket thermal insulation for commercial and industrial applications.

7. ASTM C1071 - Fibrous glass duct lining insulation (thermal and sound).
8. IECC - International Energy Conservation Code
9. ASTM C355 - Water Vapor Permeance
10. ASTM C916-85(2001)e1 - Standard Specification for Adhesives for Duct Thermal Insulation
11. ASTM C1136-02 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
12. ASTM A635/A635M-02 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Commercial Steel, Drawing Steel, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, Hot-Rolled, General Requirements
13. ASTM A924 - Hot Dip Galvanized Coils & Sheets - Tolerances

1.6 QUALITY ASSURANCE

A. Fire Hazard Rating:

1. All insulation used on the project must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 as determined by test procedures ASTM E84, NFPA 255 and UL 723. Bear UL label. All insulation must meet ASTM C553.
2. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive.
3. Components such as adhesives, mastics and cements must meet the same individual ratings as minimum requirements.
4. Install in accordance with SMACNA standards, 1995 Editions.

PART 2 PRODUCTS

2.1 APPLICATIONS

- A. Supply ducts
- B. Return ducts
- C. Outside air ducts
- D. Supply and return diffusers
- E. Grilles
- F. Registers with exposed surfaces in unconditioned areas
- G. General exhaust ducts do not receive insulation

- 1 2.2 MANUFACTURERS
2
3 A. Owens Corning
4
5 B. Knauf
6
7 C. Johns Manville
8
- 9 2.3 EXTERNAL DUCT WRAP AND GRILLE INSULATION
10
11 A. Minimum Density:
12 1. 3/4 pound per cubic foot
13
14 B. Material:
15 1. Fiberglass blanket with type FRK foil reinforced Kraft vapor barrier jacket
16
17 C. Thickness:
18 1. 2.0 inch, Minimum Value R-6.0
19
20 D. Manufacturer/Type:
21 1. Owens Corning Type 75
22
23 E. Comply with ASTM C553 standard
24
25 F. Comply with ASTM C1136-02
26
27 G. Comply with ASTM E84
28
29 H. Comply with IECC
30
- 31 2.4 INTERNAL DUCT LINER
32
33 A. Use:
34 1. Use only where specifically noted, or with written approval of Engineer.
35
36 B. Install internal duct liner that extends no more than 2'-0" below roof deck at each rooftop
37 unit.
38
39 C. Type:
40 1. 1½ inch thick, Minimum Value R-6.0
41
42 D. Manufacturer/Type:
43 1. Owens Corning/Type 150
44
45 E. Fasteners:
46 1. Manufacturer: A.J. Gerrard Company pronged straps.
47

- 1 F. Comply With ASTM C916-85(2001)e1
- 2
- 3 G. Comply with ASTM C1071 standard
- 4
- 5 H. Comply with ASTM C553 standard
- 6
- 7 I. Comply with ASTM C1136-02
- 8
- 9 J. Comply with ASTM E84
- 10
- 11 K. Comply with IECC
- 12
- 13

14 PART 3 EXECUTION

16 3.1 DUCT WRAP INSTALLATION

- 17
- 18 A. Wrap insulation tightly on the ductwork with all circumferential joints butted and
- 19 longitudinal joints overlapped a minimum of 3 inches.
- 20
- 21 B. Adhere insulation to metal with 4 inch strips of insulation bonding, using adhesive at 8
- 22 inch centers.
- 23
- 24 C. On circumferential joints, secure the 2 inch flange of the facing and tape with a minimum
- 25 of 3 inch wide foil reinforced Kraft tape.
- 26
- 27 D. On longitudinal joints, secure the overlap using 9/16 inch flared door staples applied 6
- 28 inches on centers and taped with minimum 3 inch wide foil reinforced Kraft tape.
- 29
- 30 E. Tape all pin penetrations or punctures in facing.
- 31
- 32 F. The duct wrap insulation on all rectangular/square ducts 24-inch or wider shall be
- 33 additionally secured to the bottom of the duct with mechanical fasteners such as pins and
- 34 speed clip washers. Spacing at 18-inch on center each direction to prevent sagging.
- 35
- 36 G. Fasten insulation installed on diffusers, grilles, and registers using 3 inch minimum wide
- 37 foil reinforced Kraft tape.
- 38
- 39 H. Extend insulation 1 inch beyond each outer surface of diffuser, grille, and register.
- 40

41 3.2 INTERNAL DUCT LINER

- 42
- 43 A. Provide internal duct liner as indicated on the plans.
- 44
- 45 B. Install internal duct liner on rooftop unit supply and return ducts no more than 2'-0"
- 46 below roof deck.
- 47

- 1 C. Apply the liner to the inside of the duct with heavy density side to the air stream and
2 secure to the duct with adhesive Insul-Coustic No. 225 completely coating the clean sheet
3 metal.
4
5 D. Do not use duct liner in kitchen or other areas that may have excess moisture present.
6
7 E. Secure fasteners to the ducts with adhesive.
8
9 F. Conform to SMACNA duct construction standards.
10
11 G. Accurately cut the liner and thoroughly coat the ends with adhesive to make a firmly
12 butted and tightly sealed joint.
13
14 H. Where ducts are lined, exterior insulation will not be needed except as otherwise specified.
15
16 I. Install duct liner in accordance with SMACNA standards.
17

18
END OF SECTION

SECTION 23 08 01

AIR BALANCE AND SYSTEM TESTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 23 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Testing and balancing services for the heating, ventilating, and air conditioning (HVAC) systems of this project. Final approval of the balancing agency shall be by the Engineer.
- B. The balancing agency will have a contractual relationship with the General Contractor for the satisfactory execution of testing and balancing the HVAC systems.
- C. The following are acceptable agencies:
 - 1. Delta-T, Inc., Garland (Phone: 972-494-2300)
 - 2. Engineered Air Balance, Richardson (Phone: 972-818-9000)
 - 3. Air Engineering & Testing, Inc. Dallas (Phone: 972-386-0144)
 - 4. Complete System Balance, Rockwall (Phone: 972-965-4289)
 - 5. Elite TAB, LLC., Arlington (Phone: 817-987-8939)
 - 6. Air Balancing Company, Inc., Fort Worth (Phone: 817-572-6994)

1.3 RELATED SECTIONS

- A. Section 23 00 10 - Basic Mechanical Requirements
- B. Section 23 07 01 - Duct and Grille Insulation
- C. Section 23 09 24 - Control System
- D. Section 23 36 17 - Variable Air Volume
- E. Section 23 31 01 – Ductwork
- F. Section 23 34 01 - HVAC Fans
- G. Section 23 37 14 - Air Distribution Devices

1 1.4 STANDARDS
2

- 3 A. The balancing agency shall perform the services specified herein in accordance with the
4 Associated Air Balance Council's National Standards, including revisions, to the date of
5 the contract.
6
7 B. All terms in this specification shall have their meaning defined as stated in the National
8 Standards.
9
10 C. If these specifications set forth more stringent requirements than the AABC National
11 Standards, these specifications shall prevail.
12

13 1.5 QUALIFICATIONS OF THE BALANCING AGENCY
14

- 15 A. The balancing agency shall be a member of the Associated Air Balance Council (AABC)
16 and/or certified by the National Environmental Balancing Bureau (NEBB).
17
18 B. To perform required professional services, the balancing agency shall have a minimum of
19 one "Test and Balance Engineer" certified by the Associated Air Balance Council and/or
20 the National Environmental Balancing Bureau (NEBB).
21
22 C. This certified "Test and Balance Engineer" shall be responsible for supervision and
23 certification for the total work herein specified.
24
25 D. The balancing agency shall submit records of experience in the field of air and hydronic
26 system balancing or any other data as requested by the Owner/Engineer. The supervisory
27 personnel for the firm shall have at least five (5) years' experience, and be a full time
28 employee for a minimum of six (6) months prior to the project. All employees used in
29 this project shall be qualified technicians in this specific field.
30
31 E. The balancing agency shall furnish all necessary calibrated instrumentation to adequately
32 perform the specified services. An inventory of all instruments and devices in possession
33 of the balancing agency may be required by the Owner to determine the balancing
34 agency's performance capability.
35
36 F. The balancing agency shall have operated for a minimum of five (5) years under its current
37 name.
38

39 1.6 DOCUMENTS
40

- 41 A. The General Contractor will provide the balancing agency one copy of the following
42 documents:
43 1. Project drawings (mechanical sepias if requested) and specifications.
44 2. Reviewed construction revisions pertaining to the HVAC systems.
45 3. Reviewed submittal data on HVAC equipment and systems to be installed by the
46 Mechanical Subcontractor.

4. Reviewed HVAC shop drawings.
5. Reviewed HVAC wiring diagrams, control diagrams, and equipment brochures, as appropriate.

1.7 COORDINATION

- A. It will be necessary for the balancing agency to perform its services in close coordination with the Mechanical Subcontractor.
- B. The plans and specifications indicate meters, valves, dampers, and other devices for the purpose of adjusting the system to obtain optimum operating conditions. It will be the responsibility of the Mechanical Subcontractor to install these devices in a manner that will leave them accessible, readily adjustable and complete. The balancing agency shall provide guidance if there is a questionable arrangement of a control or balancing device.
- C. The General Contractor, Mechanical Contractor, Temperature Controls Subcontractor, and the suppliers of the HVAC equipment shall all cooperate with the balancing agency to provide all necessary data on the design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.

1.8 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR

- A. The Mechanical Contractor shall complete the installation and start all HVAC systems to ensure they are working properly, and shall perform all other items as described hereinafter to assist the balancing agency in performing the testing and balancing of the HVAC systems.
- B. Air Distribution Systems:
 1. Verify installation for conformity to design.
 2. Terminate all supply, return, and exhaust ducts, and pressure test them, for leakage, as required by specification.
 3. Ensure that all splitters, extractors, and volume and fire dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside, return, relief, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
 4. Verify that all supply, return, exhaust, and transfer grilles; registers; diffusers; and high-pressure terminal units are installed and operational.
 5. Ensure that air-handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive bypass or leakage of air.
 6. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.

7. Make any necessary changes to the sheaves, belts, and dampers, as required by the balancing agency, at no additional cost to the Owner.
8. Install clean filters.

1.9 RESPONSIBILITIES OF THE TEMPERATURE CONTROLS CONTRACTOR

- A. The Temperature-Controls Contractor shall allow sufficient time in the project to provide assistance and instruction to the balancing agency in the proper use and setting of control components such as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.
- B. Furnish to the balancing agency any software and cables required to make adjustments to controls. Any unique micro-processor required to set controls shall be furnished by Temperature Controls Contractor.
- C. The Temperature Controls Contractor shall complete the installation of the temperature control system, and operate and test all control systems to ensure they are functioning properly as designed. The Temperature Controls Contractor shall assist the balancing agency in testing and balancing the HVAC systems, as described hereinafter.
 1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze-stats.
 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
 3. Calibrate room thermostats/sensors after installation, and before the thermostat control verification tests are performed. The balancing agency shall prove the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.

1.10 PRE-BALANCING CONFERENCE

- A. Prior to beginning of the testing, adjusting and balancing procedures, schedule and conduct a conference with the Architect/Engineer, General Contractor, Mechanical Contractor, Electrical Contractor and Temperature Controls Contractor. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.

1.11 NOTIFICATION FOR TESTING AND BALANCING WORK TO BEGIN

- A. The general contractor shall notify the balancing agency in writing when all heating, ventilating, and air conditioning systems are complete and ready for testing and balancing. The Mechanical Contractor shall attest that he has completed all items as described in "RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR" Section of these specifications.

- 1 B. If, upon commencing the work, the balancing agency finds that the systems are not ready,
2 or if a dispute occurs as to the readiness of the systems, the balancing agency shall request
3 an inspection to be made by the Mechanical Engineer. This inspection shall establish to
4 the satisfaction of the represented parties whether or not the systems meet the basic
5 requirements for testing and balancing. Should the inspection reveal the notification to
6 have been premature, the balancing agency shall be reimbursed for all costs for the
7 inspection and work previously accomplished. Furthermore, such items that are not ready
8 for testing and balancing shall be completed and placed in operational readiness before
9 testing and balancing services shall again be requested.

10
11
12 PART 2 PRODUCTS

- 13
14 A. Not Applicable

15
16
17 PART 3 EXECUTION

18
19 3.1 SCOPE

- 20
21 A. In accordance with Project Drawings and Specifications and as specified herein, the
22 balancing agency shall provide all supervision, personnel, instruments, calibration
23 equipment, and all other materials and services necessary to perform all testing and
24 balancing of the heating, ventilating, and air conditioning systems. All test data including
25 all pertinent calculations shall be reported on appropriate forms.

26
27 3.2 GENERAL

- 28
29 A. The testing and balancing of the heating, ventilating, and air conditioning systems shall
30 be performed by an independent balancing agency approved by the Engineer. The
31 balancing agency shall have a minimum of five years specialized experience in air and
32 hydronic system balancing, possess calibrated instruments, certified "Test and Balance
33 Engineers", and skilled technicians to perform all required tests. The balancing agency
34 shall be a certified member of the Associated Air Balance Council and/or the National
35 Environmental Balancing Bureau (NEBB).
- 36
37 B. The tests shall demonstrate the specified capacities and operation of all equipment and
38 materials comprising the systems. The balancing agency shall then make available to the
39 Owner's representative such instruments and technicians as are required for spot checks
40 of the system.
- 41
42 C. The balancing agency shall not instruct or direct the Mechanical Contractor in any of the
43 work. Any proposed changes or revision in the work shall be submitted to the Architect
44 and General Contractor in writing.
- 45

1 D. Document Review:

- 2 1. The Test and Balance Firm shall be responsible for reviewing the HVAC plans and
3 specifications relating to the test and balance services for proper arrangement and
4 adequate provisions of devices for testing, adjusting and balancing.
5 2. Test and Balance Firm shall review HVAC manufacturers' submittals data relative to
6 balanceability.
7 3. Test and Balance Firm shall review submitted HVAC automatic temperature control
8 sequences for conformity to the specifications.
9

10 3.3 SERVICES

- 11
12 A. During construction, the balancing agency shall inspect the installation of pipe systems,
13 sheet metal work, temperature controls, and other component parts of the heating,
14 ventilating, and air conditioning systems.
15
16 B. The inspections shall be performed periodically as the work progresses. A minimum of
17 two inspections are required as follows: (1) when 60 percent of the duct work is installed;
18 (2) when 90 percent of the equipment is installed. The balancing agency shall submit a
19 brief written report of each inspection to the General Contractor and Engineer.
20
21 C. Upon completion of the installation and start-up of the mechanical equipment by the
22 Mechanical Contractor, the balancing agency shall test and balance the system
23 components to obtain optimum conditions in each conditioned space in the building.
24

25 3.4 DEFICIENCIES

- 26
27 A. If in the process of performing the TAB work, any deficiencies encountered shall be
28 brought to the attention of the contractor responsible through defined procedures, and
29 entered in the punch list of deficiencies on the next daily Status Report. If correction of
30 the deficiency is urgent, the matter shall be brought to the attention of all involved parties
31 for quick resolution. The General Contractor shall provide and coordinate services of
32 qualified responsible subcontractors, suppliers and personnel as required to correct, repair
33 or replace any and all deficient items or conditions during the testing, adjusting and
34 balancing period.
35
36 B. The notification may be for single or multiple deficiencies. The work necessary to correct
37 items on the listing shall be performed and verified in writing by the affected trade.
38
39 C. All deficiencies that prevent proper TAB work from being completed shall be corrected
40 prior to submittal of the Final TAB Report, unless the correction of such deficiencies
41 cannot be accomplished in a reasonable period of time, in which case the Mechanical
42 Engineer may grant permission to submit the Final TAB Report with the deficiencies
43 detailed in the report.
44

1 3.5 AIR SYSTEM PROCEDURES
2

- 3 A. The balancing agency shall perform the following testing and balancing functions in
4 accordance with the Associated Air Balance Council's National Standards:
- 5 1. Fan Speeds:
 - 6 a. Test and adjust fan RPM to achieve design CFM requirements.
 - 7 2. Current and Voltage:
 - 8 a. Measure and record motor current and voltage.
 - 9 3. Pitot-tube Traverse:
 - 10 a. Perform a Pitot-tube traverse of main supply and return ducts to obtain total
11 CFM. If a Pitot-tube traverse is not practical, the summation of the outlets or
12 inlets may be used. An explanation why a traverse was not made must appear
13 on the appropriate data sheet.
 - 14 4. Outside Air:
 - 15 a. Test and adjust system minimum outside air by Pitot-tube traverse. If a Pitot-
16 tube traverse is not practical, the percentage of outside air may be determined
17 by calculations from the return air, outside air, and mixed air temperatures. Make
18 allowances for heat of compression and motor heat where applicable.
 - 19 5. Static Pressure:
 - 20 a. Test and record system static pressures, including suction and discharge static
21 pressure of each fan.
 - 22 6. Air Temperature:
 - 23 a. Take wet-bulb and dry-bulb air temperatures on the entering and leaving side of
24 each cooling coil. Dry-bulb temperature shall be taken on the entering and
25 leaving side of each heating coil.
 - 26 7. Zone Ducts:
 - 27 a. Adjust zone ducts to within design CFM requirements. At least one zone
28 balancing damper shall be completely open.
 - 29 8. Main Ducts:
 - 30 a. Adjust main ducts to within design CFM requirements and traverse for total
31 CFM quantities.
 - 32 9. Branch Ducts:
 - 33 a. Adjust branch ducts to within design CFM requirements. Multi-diffuser branch
34 ducts shall have at least one outlet or inlet volume damper completely open.
 - 35 10. Tolerances:
 - 36 a. Test and balance each diffuser, grille, and register to within 10 percent of design
37 requirements.
 - 38 11. Identification:
 - 39 a. Identify the location and area of each grille, diffuser, register, and terminal box.
40 This information shall be recorded on air outlet data sheets.
 - 41 12. Description:
 - 42 a. Record the size, type, and manufacturer of each diffuser, grille, and register on
43 air outlet data sheets.
 - 44 13. Terminal Boxes:
 - 45 a. Set volume regulators on all terminal boxes to meet design maximum and
46 minimum CFM requirements. All associated temperature controls shall be
47 checked for proper operation and calibration. If the terminal boxes have

1 separate settings for heating and cooling CFM, the CFM quantities for each shall
2 be recorded on air outlet data sheets. All diffusers connected to the terminal box
3 shall be read in the heating and cooling modes and their readings recorded on
4 air outlet data sheets.

5 14. Minimizing Drafts:

- 6 a. Adjust all diffusers, grilles, and registers to minimize drafts in all areas.
7

8 3.6 VERIFICATION OF TEMPERATURE CONTROL
9

- 10 A. The balancing agency shall be assisted by the Temperature Controls Contractor in
11 verifying the operation and calibration of all temperature control systems. The following
12 tests shall be conducted:
- 13 1. Verify that all control components are installed in accordance with project
14 requirements and are functional, including all electrical interlocks, damper sequences,
15 air and water reset, and fire and freeze stats.
 - 16 2. Verify that all controlling instruments are calibrated and set for design operating
17 conditions.
 - 18 3. Verify the accuracy of the final settings by taking temperature readings. The readings
19 shall be in a typical conditioned space for each separately controlled zone.
20
- 21 B. In the process of performing the TAB work, the balancing agency firm shall:
- 22 1. Verify that all dampers, valves and other controlled devices are operated by the
23 intended controller.
 - 24 2. Verify that all dampers and valves are in the position indicated by the controller
25 (open, closed, or modulating).
 - 26 3. Verify the integrity of valves and dampers in terms of tightness of close-off and of
27 full-open position.
 - 28 4. Check that all valves are properly installed in the piping system in relation to direction
29 of flow and location.
 - 30 5. Verify the proper application of all normally open and normally closed valves.
 - 31 6. Check the locations of all thermostats and humidistats for potential erratic operation
32 from outside influences such as sunlight, drafts, or cold/hot walls.
 - 33 7. Check the locations of all sensors to determine whether their position will allow them
34 to sense only the intended temperatures or pressures of the media.
 - 35 8. Check the sequence of operation for any control mode to ensure that it is in
36 accordance with the Contract Documents.
37
- 38 C. Verify that all controller set points meet the design intent. Record observations of systems
39 under DDC control. Record all default set points if different from operating set points.
40
- 41 D. Check all dampers for free and full operation, record any obstructions.
42
- 43 E. Verify the operation of all interlock systems.
44
- 45 F. Perform all system verifications to assure the safety of the system and its components.
46
- 47 G. Verify that the changeover from heating to cooling mode occurs as specified.

1
2 3.7 TEST AND BALANCE REPORT
3

4 A. The test and balance report shall be complete with logs, data, and records as required
5 herein. All logs, data, and records shall be typed on white bond paper and bound. The
6 report shall be certified, accurate and complete by the balancing agency's certified Test
7 and Balance Engineer.
8

9 B. The report shall contain the following general data in a format selected by the balancing
10 agency:

- 11 1. Project number
- 12 2. Contract number
- 13 3. Project title
- 14 4. Project location
- 15 5. Project Architect
- 16 6. Project Mechanical Engineer
- 17 7. Test & Balance agency
- 18 8. Test & Balance Engineer
- 19 9. General Contractor
- 20 10. Mechanical Subcontractor
- 21 11. Dates tests were performed
- 22 12. Certification
23

24 C. The test and balance report shall be recorded on report forms conforming to the
25 recommended forms in the AABC National Standards. At a minimum, the report shall
26 include:

- 27 1. Preface
- 28 2. A general discussion of the system, any abnormalities and problems encountered.
- 29 3. Instrumentation list
- 30 4. The list of instruments including type, model, manufacturer, serial number, and
31 calibration dates.
- 32 5. Data
- 33 6. All test and balance data indicating design and actual conditions of operation for each
34 device and/or piece of HVAC equipment.
- 35 7. System Identification
- 36 8. In each report, zones, supply, return, and exhaust openings, and traverse points shall
37 be numbered and/or lettered on mechanical drawings to correspond to the numbers
38 and letters used on the report data sheets.
- 39 9. Controls
- 40 10. Document verification of controls.
- 41 11. Occupancy Inspection
- 42 12. Make a total of three (3) inspections within ninety (90) days after occupancy of the
43 building, and make adjustments if required, to insure that satisfactory conditions are
44 being maintained throughout. Inspections to be coordinated with
45 Architect/Engineer and Owner and shall be documented with a supplemental report
46 containing data and information as required.

- 1 13. Instructions to Operating Personnel
2 14. Test and Balance Firm shall instruct the operating personnel regarding the following:
3 a. Systems Operation
4 b. Unusual Operating Conditions.
5 c. System Troubleshooting Procedures.
6

7 3.8 REPORT SUBMITTAL
8

- 9 A. Five bound copies of the test and balance report are required and shall be submitted to
10 the General Contractor for distribution to the Owner, Architect and Mechanical
11 Engineer.
12

13 3.9 FINAL ACCEPTANCE
14

- 15 A. At the time of final inspection, the balancing agency shall recheck, in the presence of the
16 Owner's representative, specific and random selections of data recorded in the certified
17 test and balance report.
18
19 B. Points and areas for recheck shall be selected by the Owner's representative.
20
21 C. Measurements and test procedures shall be the same as the original test and balance.
22
23 D. Selections for recheck, specific plus random, shall not normally exceed 15 percent of the
24 total number tabulated in the report, except where special air systems require a complete
25 recheck for safety reasons.
26
27 E. If random tests demonstrate a measured flow deviation of 10 percent or more from that
28 recorded in the certified test and balance report, the report shall automatically be rejected.
29 In the event the report is rejected, all systems shall be readjusted and tested, new data
30 recorded, a new certified test and balance report submitted, and a new inspection test
31 made, all at no additional cost to the Owner.
32

33 3.10 OPPOSITE SEASON TEST
34

- 35 A. The balancing agency shall perform an inspection of the HVAC system during the
36 opposite season from that in which the initial adjustments were made. The balancing
37 agency shall make any necessary modifications to the initial adjustments to produce
38 optimum system operation.
39

40 END OF SECTION

1 SECTION 23 09 24

2 ENERGY MANAGEMENT CONTROL SYSTEM (BACNET/ TRIDIUM)

3
4
5
6 PART 1 GENERAL SUMMARY OF WORK

- 7
8 A. Existing control system is Reliable Controls by Enviromatics. All new equipment shall
9 be connected to the existing Tridium Energy Management Control System. All
10 programming, software upgrades, controllers, etc. necessary to connect new equipment
11 to existing EMCS shall be verified and provided by Enviromatics.
12

13
14 PART 2 SEQUENCE OF OPERATION

15
16 2.1 SINGLE DUCT VAV TERMINAL UNITS WITH ELECTRIC REHEAT

17
18 A. GENERAL:

- 19 1. The classroom spaces will be served by single duct variable air volume (VAV)
20 terminals with electric reheat.
21

22 B. TEMPERATURE CONTROL:

- 23 1. Warm up: The EMCS shall determine the required warm up period based on the
24 optimized start algorithm. When the VAV box is indexed to this mode, the damper
25 shall modulate to full CFM (full open), and the electric reheat shall remain off. Once
26 the occupied space heating set point of 70°F (adj.) has been reached, the damper
27 shall close to minimum CFM and the VAV box shall be indexed to occupied mode.
28 2. Cool down: The EMCS shall determine the required warm up period based on the
29 optimized start algorithm. When the VAV box is indexed to this mode, the damper
30 shall modulate to full CFM (full open), and the electric reheat shall remain off. Once
31 the occupied space cooling set point of 74°F (adj.) has been reached, the damper
32 shall close to minimum CFM and the VAV box shall be indexed to occupied mode.
33 3. Occupied: On a rise in space temperature, the unit will modulate to provide
34 maximum CFM. As space temperature decreases, the box will modulate down to its
35 minimum CFM. As the space temperature continues to fall to below the spaces
36 heating set point, the VAV terminal shall modulate to its heating minimum CFM. At
37 this point, the electric reheat will stage on or off to maintain space temperature.
38 4. Un-Occupied: The VAV terminal unit shall modulate the electric heat and CFM to
39 maintain the unoccupied space temperature set points.
40

41 END OF SECTION

SECTION 23 31 01

DUCTWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. Ductwork:

1. Furnishing and installation of all ductwork as shown on the Drawings; acoustical and thermal linings and wrappings; flexible ducts and connections; combination smoke and fire dampers, smoke dampers, and fire dampers; duct access doors; air diffusers, grilles and registers; air volume control devices; hangers and supports; plenums and casings; turning vanes; air filters; installation of temperature control dampers, and other appurtenances necessary for a complete and operational system.
2. All work shall be preceded by taking measurements at the job site, fully coordinating all work with other trades, verifying available spaces for ductwork, and developing Shop Drawings.

1.3 RELATED SECTIONS

- A. Section 22 07 20 - Piping Insulation
- B. Section 23 33 34 - Access Doors
- C. Section 23 00 10 - Basic Mechanical Requirements
- D. Section 23 36 17 – Variable Air Volume
- E. Section 23 07 01 - Duct and Grille Insulation
- F. Section 23 08 01 - Air Balance and System Testing
- G. Section 23 34 01 - HVAC Fans
- H. Section 23 37 14 - Air Distribution Devices

1.4 REFERENCES

- A. AMCA 500 - Test Methods for Louvers, Dampers and Shutters

- 1 B. AMCA 511 - Certified Ratings Program for Air Control Devices
- 2
- 3 C. ASTM 653 - Sheet Metal, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated
- 4 (Galvanized) by the Hot-Dipped Process
- 5
- 6 D. ASTM A924 - Hot Dip Galvanized Coils & Sheets – Tolerances
- 7
- 8 E. ASTM A463 - Steel Sheet Aluminum Coated by the Hot Dip Process
- 9
- 10 F. NFPA 90A - National Fire Protection Association – Installation of Air Conditioning and
- 11 Ventilation Systems
- 12
- 13 G. NFPA 92A - Smoke-Control Systems
- 14
- 15 H. SMACNA - Sheet Metal and Air Conditioning Contractors Association
- 16
- 17 I. SMACNA HVAC Duct Construction Standards, Third Edition 2005, for Metal and
- 18 Flexible Ducts
- 19
- 20 J. U.L. - Underwriter's Laboratories
- 21
- 22 K. UL 555 - Standard for Safety; Fire Dampers
- 23
- 24 L. UL 555S - Standard for Safety; Leakage Rated Dampers for Use in Smoke Control
- 25 Systems
- 26

27 1.5 SYSTEM DESCRIPTION

28

- 29 A. Design static pressure:
 - 30 1. 1 inch w.g. minimum, for low pressure ductwork.
 - 31 2. 3 inch w.g. minimum, for medium pressure ductwork.
 - 32

33 1.6 SUBMITTALS

34

- 35 A. Product Data:
 - 36 1. Provide submittal data on all equipment specified in this section in accordance with
 - 37 Section 23 00 10, General Conditions, and Division 01.
 - 38 2. Submit product data indicating typical catalog of information including
 - 39 arrangements.
 - 40 3. Submit product data sheets indicating dimensions, general assembly, and materials
 - 41 used in fabrication.
 - 42 4. Indicate mechanical and electrical service locations and requirements of equipment.
 - 43 5. Submit manufacturer's installation instructions.
 - 44
- 45 B. Shop Drawings:
 - 46 1. Submit 1/4" per foot shop drawing(s) showing all ducts, piping and equipment
 - 47 shown by plans and specifications. Submit drawings on all mechanical rooms. The

1 drawings shall be coordinated with structural and electrical. Provide sections for all
2 congested areas and mechanical rooms. Submit prior to construction of ductwork.
3

4 1.7 QUALITY ASSURANCE

- 5
- 6 A. All equipment and materials shall be new and of the quality as specified herein. All work
7 shall comply with the Local Building Code, Mechanical Code, Fire Code, and all other
8 applicable State and Local Codes or ordinances.
9
- 10 B. All equipment and materials shall be installed in a workmanlike manner by trained and
11 experienced sheet metal technicians and mechanics as recommended by the
12 manufacturers of the products installed.
13
- 14 C. All ductwork to be manufactured in accordance with SMACNA standards.
15
- 16 D. Where the standards and requirements of this specification exceed those of SMACNA,
17 the requirements herein shall govern.
18
- 19 E. Except where specified otherwise, all sheet metal used shall be constructed from prime
20 galvanized steel sheets or coils up to 60 inches in width. Each sheet shall be stenciled with
21 manufacturer's name and gauge. Coils of sheet steel shall be stenciled throughout on 10
22 foot centers with manufacturer's name and gauge tolerances in inches.
23
- 24 F. Spiral pipe:
25 1. All pipe and fittings must be from a single manufacturer.
26
- 27 G. Flexible:
28 1. The composite assembly including insulation, vapor barrier, and glass scrim shall
29 meet the Class 1 requirements of the latest NFPA Bulletin #90A and be labeled for
30 a spread rating of 25 or less and a smoke development rating of 50 or under.
31

32 1.8 WARRANTY

- 33
- 34 A. Warranty all ductwork and dampers for 1 year from the date of final acceptance. The
35 warranty will cover workmanship, noise, chatter, whistling, and vibration. Ductwork must
36 be free from pulsation under all conditions of operation.
37

38 PART 2 PRODUCTS

39 2.1 RECTANGULAR AND ROUND RIGID DUCTS:

- 40
- 41 A. Material:
42 1. New, prime grade sheet or coil steel
43
44
45

- 1 B. Gauge:
2 1. Select gauge in accordance with SMACNA Duct Construction Standards Tables 1-3
3 to 1-9 and Appendix- page 2.
4
- 5 C. Auditorium and stages:
6 1. Increase two gauges (heavier) for the first 20 feet of supply and return duct.
7
- 8 D. Coating:
9 1. Type:
10 a. Continuous, hot-dip, galvanized coating
11
- 12 E. Application:
13 1. 1-1/4 ounces per 1 square foot, two-sided sheet
14 2. Comply with ASTM A 653.
15
- 16 F. Identification:
17 1. Sheet steel:
18 a. Stencil each sheet with manufacturer's name and gauge.
19
- 20 G. Coil steel:
21 1. Stencil coils on 10 foot centers with manufacturer's name and gauge.
22
- 23 H. Construction:
24 1. Manufacture in accordance with SMACNA Round Duct Standards, Tables 3-2A, 3-
25 2B, and 3-3, Figures 3-1, 3-2, 3-3, 3-4, and 3-5.
26 2. Pre-manufactured round duct may be used if approved by the Architect/Engineer.
27
- 28 2.2 ACCESS DOORS
29
- 30 A. Install access doors to facilitate cleaning as required by code.
31
- 32 B. Install access doors as required for access to fire protection devices.
33
- 34 2.3 SINGLE - WALL, ROUND AND FLAT OVAL DUCT AND FITTINGS (FOR
35 MEDIUM PRESSURE APPLICATION)
36
- 37 A. Medium Pressure (3-inch w.g.) rectangular duct not allowed.
38
- 39 B. Material:
40 1. New, prime grade sheet or coil steel.
41 a. Gauge:
42 (1) Select gauge in accordance with SMACNA duct construction standards.
43
- 44 C. Fittings:
45 1. By Duct Manufacturer
46

- 1 D. Coatings:
2 1. Type:
3 a. Continuous, hot-dip galvanized coating.
4
5 E. Application:
6 1. 1-1/4 ounces per 1 square foot, two-sided sheet.
7 2. Comply with ASTM A653.
8
9 F. Identification:
10 1. Sheet Steel
11 2. Stencil each sheet with manufacturer's name and gauge.
12
13 G. Construction:
14 1. Manufacture in accordance with SMACNA standards.
15
16 H. Approved Manufacturers:
17 1. United McGill Corporation ACOUSTI-k27
18 2. Lewis & Lambert, LLP
19 3. Lindab
20 4. Precision Spiral Pipe
21 5. Spiral Pipe of Texas Corporation, Inc.
22

23 2.4 FLEXIBLE DUCTS
24

- 25 A. Material: In accordance with SMACNA Metal and Flexible Duct Standards, Latest
26 Edition.
27
28 B. Construction:
29 1. Factory insulate with high density fiberglass to a minimum R value of 5.79.
30 2. Provide a positive interior air seal permanently bonded to a carbon steel spring helix.
31 3. Sheath seal in a Class 1 vapor barrier and factory seal at both ends.
32 4. Conform to U.L. 181, NFPA 90A
33
34 C. Manufacturer/Model:
35 1. ATCO 30 Series
36

37 2.5 VOLUME CONTROL DAMPERS
38

- 39 A. Manufacturer: Nailor Industries Series 1020, 1021 or equal.
40
41 B. Type:
42 1. Manually operated single blade or multi-blade
43 2. Conform to SMACNA Duct Standards (Metal & Flexible), Figures 2-12 & 2-13.
44
45 C. Application:
46 1. Provide in all branches, splits and taps whether indicated on plans or not.
47

1 D. Construction:

- 2 1. Provide an indicating device with lock to hold damper in proper position.
3 2. All manual dampers installed above hard ceilings or at other in-accessible areas shall
4 be supplied with a cable operated damper equal to Young Regulator Model 830A-
5 CC. Damper(s) to be opposed blade type constructed of .050 minimum heavy duty
6 extruded aluminum frames and blades. All necessary hardware to ensure
7 compatibility with remote cable control system shall be included. Damper blades to
8 include individual blade bushings for smooth and quiet operation. Damper blades
9 shall rotate between a matched pair of formed and punched 306 stainless steel
10 connecting slide rails which facilitate smooth blade movement and ensure alignment.
11

12 2.6 TURNING VANES

- 13
14 A. Provide on all rectangular elbows except for return air jumper ducts noted on plans.
15
16 B. Conform to SMACNA Duct Standards, Figures 2-3 and 2-4.
17

18 2.7 DUCT SEALANT

- 19
20 A. Equal to Glenkote "Seal-Flex" duct sealer, Hardcast "Irongrip 601", Foster 32-19" or
21 "Childers CP-146"
22

23 2.8 FIRE DAMPERS

24
25 A. Manufacturer/Model:

- 26 1. Fire Dampers – Pottorff, Ruskin, Greenheck, National Controlled Air or Nailor
27 2. Ceiling Fire Dampers/Thermal Blankets - CK-2000-1 thermal blanket and Model
28 CFSR-2 ceiling damper for supply outlets (round or square) and CFSR-2 for return
29 outlets (square).
30

31 B. Type:

- 32 1. 212° F fusible link fire damper.
33 2. Fire protection rating: 1.5 hours
34 3. Conform to UL Standard 555 and be UL labeled
35 4. Tested in accordance with AMCA 500.
36

37 C. Application:

- 38 1. Provide at locations shown on plans and where required by Local and State
39 ordinances.
40

41 D. Features:

- 42 1. Maximum leakage 8 cfm at 4-inch S.P.
43 2. Vertical or horizontal installation
44 3. Radiation blanket
45 4. Blades 16 gauge galvanized, maximum 6-inch width.
46 5. 5 year warranty.
47

1 E. Manufacturer/Model:

2 1. Ceiling Fire Dampers:

3 a. Pottorff Ceiling Fire Dampers/Thermal Blankets – Series CFD

4 b. Equals by Nailor Industries, NCA, United Air, Ruskin, Greenheck

5
6 2.9 FIRE SAFETY FUNCTIONS - DUCT MOUNTED SMOKE DETECTORS,
7 CONTROL RELAYS, AND SMOKE FIRE DAMPER CONTROL
8

9 A. The Fire Alarm Contractor shall provide the Duct Mounted Smoke Detectors, Control
10 Modules, Power Relays, and Control Relay devices and perform the final low-voltage
11 hook-up to the fire alarm system.
12

13 B. Duct mounted smoke detector housings and sample tubes shall be furnished by the Fire
14 Alarm Contractor and mounted by the Mechanical Contractor.
15

16 C. Line voltage hook-up shall be by the Electrical Contractor.
17

18 D. Fire Alarm Safety Control Functions, which may include the operation of fire alarm
19 Control Relays [CR] associated with duct mounted smoke detector [D]/air handler shut
20 down, high volume low speed (HVLS) fan shut down, fire door hold-back and release,
21 smoke fire damper motor control, et cetera, shall be initiated via Control Relays which
22 shall be de-energized under fire alarm conditions. These Control Relays shall be provided
23 and mounted by the Fire Alarm Contractor and located within three feet of the unit.
24 These Control Relays shall be controlled by a fail-safe Fire Safety Control Function
25 circuit. For each controlled device the contractor providing the device shall wire it
26 internally for fail-safe shut-down and provide a labeled 3' coil of cable outside the unit to
27 allow the fire alarm contractor to make final connection to the Common and N.O. or
28 N.C. dry contacts on the fire alarm SPDT Control Relay. Each Fire Safety Control
29 Function circuit controlled device shall be configured such that when the fire alarm
30 system safety control circuit is re-energized, by the fire alarm control panel, the device
31 shall return to normal operation (e.g. be ready to re-start) without a need for manual or
32 environmental control system intervention.
33
34

35 PART 3 EXECUTION

36
37 3.1 INSTALLATION

38
39 A. General:

40 1. Erect all ducts in the general locations shown.
41

42 B. Conform to all structural and finish conditions of the building.
43

44 C. Ductwork shall not be allowed to pass through or over designated electrical rooms.
45

- 1 D. Before fabricating any ductwork, check the physical conditions at the job site and make
2 all necessary changes in cross sections, offsets, and similar items, whether they are
3 specifically indicated or not.
4
- 5 E. Where ductwork is shown to be lined on the inside with duct liner, the sizes shown on
6 the plans are the inside dimensions. Therefore, sheet metal dimensions shall be increased
7 accordingly.
8
- 9 F. Seal all joints both transverse and longitudinal seams, with duct sealant in accordance to
10 Table 1-2 Class B.
11
- 12 G. Install 1” roll type filter media on all return duct openings prior to starting blowers. Leave
13 in place and change as necessary during construction.
14
- 15 H. Before installing grilles, operate air conditioning unit fans and remove all debris or foreign
16 matter.
17
- 18 I. Rectangular duct:
19 1. Construct in accordance with SMACNA, Duct Construction Standards for the
20 specific duct pressure classification involved (see pressure classification). Do not use
21 radius ells with square throats.
22
- 23 J. Round duct:
24 1. Connect with slip type joints using a minimum of three sheet metal screws per joint
25 and in accordance with SMACNA.
26
- 27 K. Flexible ducts:
28 1. All flexible ducts shall be demountable and individual lengths shall not be in excess
29 of seven feet.
30 2. Use only factory-made connectors.
31 3. Flexible ducts should be installed fully extended, free of sags and kinks.
32
- 33 L. Reinforcement:
34 1. Reinforce all ducts to prevent buckling, breathing, vibration, or unnecessary noise.
35 2. Reinforcing shall be in accordance with SMACNA Duct Construction Standards
36 (Metal and Flexible), Tables 1-3, 1-4, 1-5, 1-6, 1-7, 1-8, and 1-9 plus any additional
37 reinforcing to meet job conditions.
38 3. All ducts shall be supported in accordance with SMACNA Duct Construction
39 Standards (Metal and Flexible), Tables 4-1, 4-2, 4-3.
40
- 41 M. Flexible Connections:
42 1. Where ducts connect to fans or air handling units, make flexible airtight connections
43 using "Ventglas" fabric.
44 2. The fabric must be fire-resistant, waterproof and mildew resistant with a weight of
45 approximately 30 ounces per square yard.
46 3. Provide a minimum of 1/2 inch slack in the connections, and a minimum of 2-1/2
47 inches distance between the edges of the ducts.

4. Provide a minimum of 1 inch slack for each inch of static pressure on the fan system.
5. Securely fasten fabric to apparatus and to adjacent ductwork by means of galvanized flats or draw bands.
6. Do not install outdoors, except where detailed on plans.
7. Where connections are made in outdoor locations, seal fabric to metal with mastic.

N. Access Doors:

1. Install ductwork access doors in structural angle frames and provide with sash locks and hinges arranged for convenient access.
2. Construct doors which occur in insulated ducts with an insulation filler.
3. All access doors shall be appropriately labeled.

O. Flashing and Opening Sealing:

1. Ducts passing through roofs or exterior walls:
 - a. Provide suitable flashing to prevent rain or air currents from entering the building as detailed on plans.
 - b. The flashing shall be minimum No. 24 gauge galvanized steel.

P. Ducts passing through mezzanine walls:

1. Completely seal the penetration with acoustic sealant and fill all gaps between the ductwork and the wall materials.
2. Sealant must be capable of preventing sound from exiting the mechanical rooms through these openings.

Q. Ducts penetrating the floor of mezzanine mechanical areas:

1. Make the entire penetration watertight by installing appropriate flashing and/or application of G.E. silicone sealant.
2. The penetration must be capable of maintaining standing water in the mechanical area without allowing any water through the opening.

R. Duct Leakage:

1. Seal ductwork in accordance with Table 1-2 of the SMACNA HVAC Duct Construction Standards - Metal and Flexible (1995 edition).
2. Minimal leakage is expected for ductwork constructed to these standards but in no case shall the total leakage exceed 5% of designed CFM.
3. All joints to be sealed with duct sealant.

S. Fire and Smoke Dampers:

1. Install fire and smoke dampers at locations shown on plans, and where required by local and state ordinances.
2. Do not compress or stretch SFD, FD frame into duct or opening.
3. Install dampers square and free from racking with blade running horizontally.
4. Handle damper suing sleeve or frame. Do not lift damper using blades actuator, or jackshaft.
5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.
6. Provide access doors in attached ductwork for inspection.

7. Stencil each door "Fire Damper Access" per U. L. 555 standard.
8. Install fire dampers in openings utilizing steel angles, sleeves, and other materials, and practices required to provide an installation equivalent that used by manufacturer when dampers were tested at UL.
9. Install in accordance with damper manufacturer's published recommendations and instructions and NFPA Standard 90A.

3.2 BALANCING DAMPERS

A. Volume Control Dampers:

1. Install manually operated volume control dampers in all branch ducts, splits or taps whether indicated on the drawings or not. Install a minimum of 5'-0" from grille/diffuser.
2. Provide indicating device with lock to hold damper in position.

B. Cable Operated Dampers:

1. Install a minimum of 5'-0" from grille/diffuser.
2. Install to facilitate smooth blade movement and ensure alignment.

C. Back Draft Dampers:

1. Install back draft dampers as shown on plans.
2. Manufacturer: Nailor Industries Series 1300 or equal.

D. Air Intake Ducts:

1. Insulate all outside air intake ducts.

3.3 DAMPER IDENTIFICATION

- A. Provide a securely attached red band and a label reading "Damper Location" at the location of all concealed manual dampers.
- B. All manual dampers which are not readily visible after duct insulation installation shall be identified in this manner.

3.4 DUCTWORK SUPPORT

- A. All ducting must be supported from building structure.
- B. Duct straps are not allowed to be screwed to roof decks, support from cross bridging or supported from bottom chord of joists.
- C. Do not support from roof or floor deck joist bridging.
- D. Support sizes and spacing shall conform to SMACNA Standards.

END OF SECTION

SECTION 23 33 34

ACCESS DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Access doors

1.3 RELATED SECTIONS

- A. Division 28 - Fire Alarm System
- B. Section 22 05 24 - Valves - General
- C. Section 22 11 17 - Domestic Water Piping and Appurtenances
- D. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances
- E. Section 22 13 18 - Condensate Piping
- F. Section 22 16 01 - Natural Gas Piping and Appurtenances
- G. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers
- H. Section 23 00 10 - Basic Mechanical Requirements
- I. Section 23 08 01 - Air Balance and System Testing
- J. Section 23 09 24 - Control System
- K. Section 23 31 01 - Ductwork

1.4 SUBMITTALS

- A. Provide submittal data on all items specified in this section in accordance with Specification Section 23 00 10, General Conditions, and Division 01.

1 PART 2 PRODUCTS

2
3 2.1 MANUFACTURERS

4
5 A. Acudor

6
7 B. Elmdor

8
9 C. Mifab

10
11 2.2 ACCESS DOORS:

12
13 A. Locations requiring access doors:

- 14 1. Concealed valves
- 15 2. Traps
- 16 3. Trap primers
- 17 4. Controls
- 18 5. Cleanouts
- 19 6. Dampers
- 20 7. Ducts adjacent to fire doors, fire dampers, and smoke detectors.
- 21 8. Equipment above hard ceilings.
- 22 9. Other equipment requiring accessibility for operation and maintenance.

23
24 B. Type:

- 25 1. Hinged flush-type steel framed door with straps and exposed narrow border.

26
27 C. Minimum size:

- 28 1. 18" x 18" unless otherwise indicated.
- 29 2. 24" x 24" for equipment above hard ceilings.
- 30 3. Conform to architectural panel pattern for acoustical ceilings.
- 31 4. Confirm size with Building Inspector and Engineer.

32
33 D. Construction:

- 34 1. Hinges: Concealed continuous type.
- 35 2. Locking Device: Flush cam type, screw driver operated.

36
37 E. Fire Rating:

- 38 1. Same or better fire rating than the surrounding area.

39
40 F. Access doors located in kitchens, restrooms or areas where water is present shall be
41 stainless steel.

42
43 2.3 FACTORY PAINTING

44
45 A. Apply prime coat of rust inhibiting paint, unless located in wet area.

46
47

1 PART 3 EXECUTION

2

3 3.1 INSTALLATION

4

5 A. Install in accordance with manufacturer's instructions and recommendations.

6

7 B. In suspended acoustical ceilings, provide a beaded pin or other approved means for
8 identification and easy removal where necessary.

9

10 C. Access doors shall only be installed in areas/locations that are readily accessible.

11

12 D. Doors shall be installed in such a manner that door will open 180 degrees.

13

14

END OF SECTION

SECTION 23 34 01

HVAC FANS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Centrifugal fans
- B. Axial fans

1.3 RELATED SECTIONS

- A. Section 23 00 10 - Basic Mechanical Requirements
- B. Section 23 08 01 - Air Balance and System Testing
- C. Section 23 31 01 - Ductwork
- D. Section 23 37 14 - Air Distribution Devices

1.4 REFERENCES

- A. AMCA – Air Moving and Conditioning Association, Inc.
- B. UL – Underwriter’s Laboratory

1.5 QUALITY ASSURANCE

- A. UL Listed and Bear Label
- B. Tested in accordance with AMCA standards

1.6 SUBMITTALS

- A. Provide submittal data on all items specified in this section in accordance with Specification Section 23 00 10, General Conditions, and Division 01.
- B. Submit product data indicating typical catalog data, including arrangements, dimensions, general assembly, and materials used in fabrication.

1 C. Provide in table form a schedule similar to drawings with data listing all fans,
2 information, accessories, etc.

3
4 D. Indicate mechanical and electrical service locations and requirements.
5
6

7 PART 2 PRODUCTS

8
9 2.1 MANUFACTURERS

10
11 A. Acme

12
13 B. Cook

14
15 C. Greenheck

16
17 D. PennBarry

18
19 E. Twin City Fans
20

21 2.2 GENERAL

22
23 A. Provide fan type, arrangement, capacity, size, motor horsepower, and motor voltage as
24 shown on the drawings.
25

26 B. Rate fans according to appropriate Air Moving and Conditioning Association, Inc.
27 (AMCA) approved test codes and procedures. Seal to be attached.
28

29 C. Supply fans with sound ratings below the maximums permitted by AMCA standards.
30

31 D. All fans provided must bear the UL Label.
32

33 E. Sound levels shall be as listed or quieter. Fans with excessive noise will be replaced at
34 Contractor's expense.
35

36 F. Fans are to be supplied with engraved aluminum nameplates indicating manufacturer,
37 serial number, and model number.
38

39 2.3 ROOF MOUNTED EXHAUST AND SUPPLY FANS

40
41 A. Type:

42 1. Centrifugal direct or belt driven fans with aluminum fan wheels.
43

44 B. Motors:

45 1. Enclosed with prelubricated bearings designed for 200,000 operating hours.

1 2. Motor to be electronic commutation motor specifically designed for fan applications.
2 Internal motor circuitry shall convert AC power supplied to the fan to DC power to
3 operate the motor. Motor shall be speed controllable down to 20% of full speed
4 (80% turndown). Speed shall be controlled by either a potentiometer dial mounted
5 on the motor or by a 0-10VDC signal. Motor shall be a minimum of 85% efficient
6 at all speeds.
7

8 C. Mounting:

9 1. Resilient mounts outside the air stream.
10

11 D. Cooling:

12 1. Forced air cooling.
13

14 E. Construction:

- 15 1. Hoods, housings & bases: Aluminum
16 2. Provide 1/2 inch galvanized mesh bird screen over openings
17 3. Bearings: Heavy duty regreasable ball type in a cast iron pillowblock housing selected
18 for a minimum L50 life in excess of 200,000 hours at maximum catalogued operating
19 speed.
20

21 F. Features:

- 22 1. Disconnect switch: Factory wire the switch and motor to the junction box
23 2. Automatic dampers with curb flanges
24 3. Insulated, prefabricated curb with cant strips and with resilient gasket on top flange.
25 4. Minimum 18 gauge galvanized steel or aluminum.
26 5. Direct Drive Fans:
27 a. FACTORY INSTALLED VARIABLE SPEED CONTROLLER.
28 b. Vented extension roof curb for kitchen hood exhaust fan.
29 6. Height:
30 a. 18 inches minimum
31 7. Factory installed automatic belt tensioner to (to maintain proper belt tension).
32 8. Lifting lugs.
33

34 G. Verify roof slope so that fans are installed in a level condition.
35

36 H. Coordinate and furnish curbs that are compatible with roof being installed.
37

38 2.4 CEILING MOUNTED EXHAUST FANS
39

40 A. Type:

41 1. Centrifugal direct driven in-line fans with galvanized steel fan wheels.
42

43 B. Motors:

- 44 1. Permanently lubricated with built-in thermal overloads.
45 2. Mounting: Resilient mounts.
46 3. Cooling: Forced air cooling.
47

1 C. Construction:

- 2 1. Hoods, housings & bases: galvanized steel, insulated, integral aluminum backdraft
3 damper.

4
5 D. Features:

- 6 1. Disconnect switch: Internal wiring box with switch.
7 2. Blower assembly to be easily removed without disconnecting the ductwork.
8 3. Factory tested prior to shipment.
9 4. Powder painted white steel grille.
10 5. FACTORY INSTALLED VARIABLE SPEED CONTROLLER.
11 6. Provide 277 volt to 120 volt transformer.

12
13 2.5 SUPPLEMENTAL EQUIPMENT

14
15 A. Weatherproof motor covers for outdoor installations:

- 16 1. Apply the same finish as used on the fan.
17

18 B. Belt driven fans:

- 19 1. Equip the fan motors with variable pitch sheaves. Select the sheave size for the
20 approximate midpoint of adjustment and to provide not less than 20 percent speed
21 variation from full open to full closed.
22

23 C. Nonadjustable motor sheaves:

- 24 1. Use for motor sizes over 15 horsepower.
25

26 D. Factory wired, safety disconnect switch on each unit.

27
28 E. Heaters with starters.

29
30 F. Internal overload protection circuit.
31

32 2.6 PROTECTIVE COATINGS

33
34 A. Apply manufacturer's standard prime coat and finish to all fans, motors and accessories,
35 except on aluminum surfaces or where special coatings are required.
36

37 B. Galvanizing:

- 38 1. Hot dip coat all surfaces which require galvanizing.
39 2. Where galvanizing is specified, a zinc coating may be used.
40 3. After fabrication, apply the zinc coating and air dry the coating to 95 percent pure
41 zinc.
42 a. Zinc Coatings:
43 (1) Amercoat
44 (2) Diametcoat
45 (3) Sealube
46 (4) Zincolate
47

- 1 C. All exhaust fans which will operate in a corrosive environment (Science Labs, etc.) shall
2 have a factory applied acid resistant coating.
3
4

5 PART 3 EXECUTION
6

7 3.1 INSTALLATION
8

- 9 A. Install fans according to the manufacturer's instructions and in the locations shown on
10 the drawings.
11

- 12 B. Verify compliance of “in Situ” vibration readings with AMCA Standard 204-05.
13

- 14 C. All fans shall be air balanced in accordance with Section 23 08 01.
15

- 16 D. Top of level curb to have minimum 11” from finished roof to top of curb.
17

- 18 E. Screw fans to curbs with gasketed screws.
19

20 3.2 START-UP
21

- 22 A. Start fans to verify rotation and operation sequence prior to test and balance.
23

24 3.3 IDENTIFICATION
25

- 26 A. Provide identification per Section 23 05 54.
27

28 END OF SECTION
29

SECTION 23 36 17

VARIABLE AIR VOLUME TERMINAL UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 23 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Constant volume terminal units.
- B. Variable volume terminal units.

1.3 RELATED SECTIONS

- A. Section 23 00 10 - Basic Mechanical Requirements
- B. Section 23 31 01 - Ductwork
- C. Section 23 09 24 - Energy Management Control System
- D. Section 23 08 01 - Air Balance and System Testing

1.4 REFERENCES

- A. UL Listed - Underwriters Laboratory
- B. ARI 880 – Air Terminals
- C. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- D. UL 181 - Factory-Made Air Ducts and Connectors.
- E. ARI 885 - Air-Conditioning and Refrigeration Institute Standard Rating Conditions for Air Terminals for UNLINED duct.
- F. UL - Shutoff terminal must be UL listed as a Room Air Terminal.
- G. ASTM A 527 (Steel Sheet, Zinc Coated Galvanized)

1 1.5 SUBMITTALS

- 2
- 3 A. Provide submittal data on all items specified in this section in accordance with
- 4 Specification Section 23 00 10, General Conditions, and Division 1.
- 5
- 6 B. Submit shop drawings and product data.
- 7
- 8 C. Submit shop drawings and product data for manufactured products and assemblies
- 9 required for this project.
- 10
- 11 D. Submit performance data at the scheduled conditions.
- 12
- 13 E. Indicate water, drain, and electrical rough-in connections on shop drawings or product
- 14 data.
- 15
- 16 F. Submit manufacturer's installation instructions.
- 17
- 18

19 PART 2 PRODUCTS

20

21 2.1 MANUFACTURERS

- 22
- 23 A. General
- 24 1. Unit performance data must be rated in Accordance with ARI Standard 880, and
- 25 must display the ARI Symbol on all standard units.
- 26 2. Shutoff terminals must be UL listed as a Room Air Terminal and bear U.L. label.
- 27
- 28 B. Acceptable Manufacturers
- 29 1. Trane
- 30 2. Titus
- 31 3. Nailor
- 32 4. Metalaire
- 33
- 34 C. Substitution: Any manufacturer desiring to furnish equipment on this project shall submit
- 35 COMPLETE submittal data ten (10) days prior to the bid date. Catalog cut sheets and
- 36 sales data are not acceptable. The unit manufacturer shall list all deviations from the
- 37 specified unit. Any manufacturer allowed to bid this project will be listed herein or by
- 38 addenda. Listing herein or by addenda does not relieve the contractor from providing
- 39 equipment which meets both the letter and the intent of these documents. Only those
- 40 manufacturers listed herein or by addenda will be considered as viable suppliers on this
- 41 project.
- 42

1 2.2 MANUFACTURED UNITS

- 2
- 3 A. The contractor shall furnish and install ceiling mounted constant or variable air volume
- 4 air control terminals for connection to single medium pressure duct, central air systems,
- 5 with constant volume or variable volume (as scheduled and/or specified) electric actuator
- 6 wired to terminal strip. The direct digital controller shall be provided by the building
- 7 automation system contractor for mounting at the variable air volume manufacturer's
- 8 factory. The unit manufacturer shall provide and mount a 120/24 VAC transformer, also.
- 9 Where hot water heating coils are shown, they shall be factory mounted on the units by
- 10 the manufacturer.
- 11
- 12 B. Identify each terminal unit with clearly marked identification label and airflow indicator.
- 13 Label shall include unit nominal air flow, maximum factory set air flow, minimum factory
- 14 set air flow, and electric coil type.
- 15

16 2.3 FABRICATION

- 17
- 18 A. Casings. Units shall be completely factory assembled, manufactured of corrosion
- 19 protected welded or screwed steel, and fabricated with a minimum of 18-gauge metal on
- 20 the high pressure (inlet) side of the VAV damper and 22-gauge metal on the low pressure
- 21 (outlet) side and unit casing. Plenum air filter shall be provided on all fan powered units.
- 22
- 23 B. INSULATION - Foil Face - Interior surface of unit casing is acoustically and thermally
- 24 lined with a minimum of 1/2 inch, R-Value 2.2 1.9 lb./cu. ft. foil face insulation. All
- 25 exposed edges are sealed to prevent fibers in the airstream. Meets NFPA-90A, UL 181
- 26 and bacteriological standard ASTM C 665.
- 27
- 28 C. Assembly: Air volume damper, fans, and controls in single cabinet. Fan powered units
- 29 shall be provided with removable access panel for servicing interior components.
- 30
- 31 D. Plenum Air Outlets: Flange duct connections on integral outlets. Fan discharge with
- 32 flange duct connection.
- 33

34 2.4 VOLUME DAMPER

- 35
- 36 A. Locate air volume damper assembly inside unit casing. Construct from extruded
- 37 aluminum or a minimum of 20-gauge galvanized steel components. Key damper blades
- 38 into shaft with nylon fitted pivot points. Flow sensor must be provided regardless of
- 39 control chosen. Flow sensor must be a ring or cross. Bar or single point sensing device is
- 40 not acceptable.
- 41
- 42 B. Mount manually operated damper quadrant or automatic damper operator and automatic
- 43 flow control assembly.
- 44
- 45 C. Air volume control damper shall be factory calibrated assembly consisting of air
- 46 modulation damper and extension for connection to control actuator. All actuator linkage
- 47 shall be protected by a sheet metal enclosure provided by the terminal unit manufacturer.

- 1
2 D. Air volume control damper shall be factory calibrated assembly consisting of air valve
3 with integral actuator.
4
5 E. Electric actuator shall position damper. The electric actuator shall be provided by the
6 terminal unit manufacturer.
7

8 2.5 HEATING COILS
9

- 10 A. Electric Heating Coil: Slip-in type, open coil design, factory wired and mounted, and
11 equipped with primary and secondary over-temperature protection, integral control box
12 with built-in magnetic contactors, minimum air flow switches, sail switches not
13 acceptable. Heater must be factory mounted on unit discharge to minimize air
14 temperature stratification.
15
16 B. Capacity and stages: Per schedule or as noted herein. All electric heaters with scheduled
17 capacity of five (5) kW and greater shall be provided with two (2) stage heaters.
18

19 2.6 WIRING
20

- 21 A. Factory mount and wire controls. Mount electrical components in control box with
22 removable cover. Incorporate single point electrical connection to power source.
23
24 B. Factory mount transformer for control voltage on units. Provide terminal strip in control
25 box for field wiring of thermostat and power source.
26

27 2.7 SEQUENCE OF OPERATION, AIR TERMINAL UNITS
28

- 29 A. Refer to Section 23 09 24 for sequences.
30
31 B. Staged Electric Heater - If temperature continues to drop the electric heat shall be staged
32 on to maintain the heating setpoint. All units with over 5 kW of electric heat shall be two
33 (2) stage.
34

35 2.8 TESTS
36

- 37 A. Factory set and check all analog electronic to within 5% of scheduled maximum and
38 minimum settings. Base performance on tests conducted in accordance with ARI 880.
39
40 B. Maximum Casing Leakage: 1 percent of nominal air flow at 0.5 in w.g. inlet static pressure.
41
42 C. Maximum Damper Leakage: 1 percent of design air flow at 4 in w.g. inlet static pressure.
43
44

1 PART 3 EXECUTION

2
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17
18
19

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. The sheet metal contractor shall install a minimum of two (2) feet of straight hard duct on the high pressure inlet connection to the terminal unit. Attached to the straight duct the sheet metal contractor can use a maximum of three (3) feet of high pressure flex duct for connection to the main supply duct. All joints shall be seal per these contract documents.

3.2 ADJUSTING

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design air flow to 30 percent nominal air flow. Set units with heating coils for minimum 30 percent full flow, or as scheduled.

END OF SECTION

1 SECTION 23 37 14

2
3 AIR DISTRIBUTION DEVICES

4
5 PART 1 GENERAL

6
7 1.1 RELATED DOCUMENTS

- 8
9 A. Drawings and general provisions of Contract, including General and Supplementary
10 Conditions, Division 01 Specifications and Section 23 00 10, apply to this Section.
11

12 1.2 SECTION INCLUDES

- 13
14 A. Grilles
15
16 B. Diffusers
17
18 C. Registers
19

20 1.3 RELATED SECTIONS

- 21
22 A. Section 23 33 34 - Access Doors
23
24 B. Section 23 00 10 - Basic Mechanical Requirements
25
26 C. Section 23 08 01 - Air Balance and System Testing
27
28 D. Section 23 31 01 - Ductwork
29
30 E. Section 23 34 01 - HVAC Fans
31

32 1.4 REFERENCES

- 33
34 A. ARI Standard 890-94 Rating of Air Diffusers and Air Assemblies.
35

36 1.5 SUBMITTALS

- 37
38 A. Provide submittal data on all items specified in this section in accordance with
39 Specification Section 23 00 10, General Conditions, and Division 01.
40
41 B. Product data for review prior to placement of purchase order:
42 1. Outlets
43 2. Grilles
44 3. Registers
45 4. Control devices
46 5. Diffusers
47 6. Similar equipment

- 1
2 C. Product data shall be submitted for each device specified. Data shall be arranged to match
3 grille schedule.
4
5 D. If a manufacturer other than the one scheduled on the plan is used, the sizes shown on
6 the plans shall be checked for performance, noise level, face velocity, throw, pressure
7 drop, etc., before the submittal is made.
8
9 E. Selections shall meet the manufacturer's own published data for the above performance
10 criteria.
11
12 F. If grilles other than those scheduled by name are furnished, manufacturer shall be
13 prepared to demonstrate compliance with noise criteria at Engineer's request and to
14 Engineer's satisfaction.
15

16 1.6 COORDINATION

- 17
18 A. Coordinate this work with work under Division 26 to insure that intended functions of
19 lighting and air systems are achieved.
20
21 B. Locations of outlets on plans are approximate and shall be coordinated with other trades
22 to make symmetrical patterns.
23
24 C. Locations shall be governed by the established pattern of the lighting fixtures or
25 architectural reflected ceiling plan.
26
27 D. The Contractor shall move any grille, register, or outlet up to four feet in any direction as
28 directed by the Engineer at no additional cost.
29
30

31 PART 2 PRODUCTS

32
33 2.1 GENERAL

- 34
35 A. Provide grilles, registers and diffusers as shown or scheduled on the plans. Conform to
36 ARI 890-94.
37
38 B. All air distribution devices in kitchen and any wet areas such as locker rooms, showers
39 and restrooms shall be 100% aluminum construction.
40
41 C. All air distribution devices for 1-hour structures (walls or ceilings) shall be steel
42 construction conforming to all codes and standards.
43

44 2.2 MANUFACTURERS

- 45
46 A. Metalaire
47

1 B. Krueger

2
3 C. Titus

4
5 D. Nailor

6
7 E. Carnes

8
9 F. Price

10
11 G. Tuttle & Bailey

12
13 2.3 PERFORMANCE CRITERIA

14
15 A. Throw: Velocity at the end of the throw in the five-foot occupancy zone will be between
16 25 to 50 FPM.

17
18 B. Noise levels (NC Curve):

19 1. Not to exceed those scheduled below.

20 a. Classrooms & Libraries - 25 N.C.

21 b. Cafeterias - 30 N.C.

22 c. Gymnasiums - 40 N.C.

23
24 C. All devices shall be tested per Air Diffusion Council and labeled as such.

25
26 2.4 FINISHES

27
28 A. Paint exposed devices with factory standard prime coat or factory finish coat as shown
29 on plans.

30
31
32 PART 3 EXECUTION

33
34 3.1 INSTALLATION

35
36 A. Where called for on the schedules, the grilles, registers and ceiling outlets shall be
37 provided with deflecting devices and manual dampers. These shall be the standard
38 product of the manufacturer, subject to review by the Engineer.

39
40 B. All ceiling devices shall be furnished to be compatible with the ceilings in which they are
41 installed.

42
43 END OF SECTION

ELECTRICAL

DIVISION 26

26 00 00	Electrical
26 00 30	Warranty Period
26 00 90	Electrical Submittal Procedures
26 05 11	Electrical Demolition
26 05 19	Low Voltage Electrical Power Conductors And Cables
26 05 19.19	MC Cable
26 05 33.11	Raceways And Conduits for Electrical Systems
26 05 33.13	Boxes And Fittings for Electrical Systems
26 09 23.13	Motion Sensor Lighting Controls
26 27 26	Wiring Devices
26 28 13	Fuses
26 28 16	Enclosed Safety Switches And Circuit Breakers
26 50 00	Lighting



ELECTRICAL

DIVISION 26

26 00 00	Electrical
26 00 30	Warranty Period
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26 27 26	Wiring Devices
26 28 13	Fuses
26 28 16	Enclosed Safety Switches And Circuit Breakers
26 50 00	Lighting



1 SECTION 26 00 30

2
3 WARRANTY PERIOD

4
5
6 PART 1 GENERAL

7
8 1.1 SECTION INCLUDES

9
10 A. Procedures during the warranty period.

11
12 1.2 RELATED SECTION

13
14 A. Drawings and general provisions of Contract, including General and Supplementary
15 Conditions, Division 1 Specifications and Division 26, Section 26 00 00, apply to this
16 Section.

17 1. Section 26 00 00 - Electrical

18
19 1.3 WARRANTY

20
21 A. This Contractor shall warranty all work against defective materials and workmanship for
22 a period of one year from and after date of acceptance of the installation by the owner.

23
24 B. Neither the final payment nor any provisions in Contract Documents shall relieve this
25 Contractor, or the Contractor, of the responsibility for faulty materials or workmanship.

26
27 C. The contractor shall remedy any defects due thereto, and pay for any damage to other
28 work resulting there from, which shall appear.

29
30 D. This Warranty shall not be construed to include the normal maintenance of the various
31 components of the system covered by these specifications.

32
33 1.4 MAINTENANCE SERVICE

34
35 A. Provide normal maintenance services recommended by the manufacturer at no additional
36 cost to the Owner during the warranty period.

37
38
39 PART 2 PRODUCTS

40
41 A. Not Used.

1 PART 3 EXECUTION

2

3 A. Not Used.

4

5

END OF SECTION

SECTION 26 00 90

ELECTRICAL SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. This section supplements section 01 33 00 Submittal Procedures and contains additional requirements applicable to Division 26 submittals.

1.2 SECTION INCLUDES

- A. This section includes, but is not limited to:
 - 1. Electrical submittal procedures
 - 2. List of required Division 26 submittals to the engineer
- B. This section applies only to the Division 26 specifications. Submittals required by other specification divisions are not included here, even though the same subcontractor may be providing work under other divisions.

1.3 RELATED SECTION

- A. Section 01 33 00 – Submittal Procedures

1.4 SUBMITTALS

- A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the architect, engineer and owner.
- B. Manufacturers: Manufacturers submitted shall be as per the acceptable manufacturers listed in each specification section or referenced schedule. For additional manufacturers requiring approval, reference the Substitution of Products article in section 26 00 00.
- C. Required submittals: Refer to the Submittals article of each individual Division 26 specification section for the required items to be submitted.
- D. Color selection: Some products require that a color selection be coordinated with the architect. Information regarding such products shall be submitted to the architect.
- E. Contractor's coordination submittals: The contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the project, but such data shall remain between the contractor and his subcontractors and will not be reviewed by the engineer.
- F. Electronic Submittals: Provide submittals in pdf format. Paper submittals will be rejected.

1 G. Coordination correspondence: The contractor may desire to verify the acceptability of a
2 particular item prior to assembling the submittal package. The contractor may send
3 material directly to the engineer for comments and feedback. This communication,
4 whether by mail, fax, or e-mail, will be treated as normal coordination correspondence
5 and will not be tracked or documented as a formal submittal. The engineer may or may
6 not respond to such correspondence. If the engineer agrees, in writing, to the use of a
7 particular item, then that same material shall be included in the submittal package along
8 with a copy of the correspondence.
9

10 H. Unapproved products: If materials or equipment are installed before being reviewed and
11 approved by the engineer, the contractor shall be liable for the removal and replacement
12 of such unapproved materials and equipment, at no additional expense to the owner.
13 Additionally, if the removal and replacement of unapproved materials or equipment
14 necessitates the removal and replacement of other related materials or equipment, then
15 the contractor shall be liable for the removal and replacement of the related materials and
16 equipment at no additional expense to the owner.
17

18 1.5 PRODUCT DATA

19

20 A. Where the content of manufacturer submittal literature includes data not pertinent to the
21 submittal, clearly indicate which portions of the contents are being submitted for review.
22 Catalogs, pamphlets, or other documents submitted to describe items on which review is
23 being requested shall be specific and identifications in catalog, pamphlets, etc., of items
24 submitted shall be clearly made in a contrasting color or highlighting. Data of a general
25 nature shall not be acceptable.
26

27 1.6 SHOP DRAWINGS

28

- 29 A. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to
30 show all pertinent aspects of the item.
31
32 B. Types of prints required: Submit in pdf format.
33

34 1.7 SEQUENCING

35

- 36 A. Submit product information within 30 calendar days after the contractor has received the
37 owner's notice to proceed or in accordance with Architect's requirements, whichever is
38 sooner.
39
40 B. After the engineer has reviewed the submittals, make necessary revisions as directed by
41 the engineer and resubmit.
42
43 C. After the submittal has been reviewed and approved by the engineer, proceed to purchase
44 materials and perform the work.
45

1 1.8 SCHEDULING

- 2
3 A. Failure to submit items that meet the requirements of the contract documents in ample
4 time for review shall not entitle the contractor to an extension of contract time, and no
5 claim for extension by reason of such default shall be allowed. The contractor may be
6 held liable for delays so occasioned.
7

8
9 PART 2 PRODUCTS

- 10
11 A. Not applicable.
12

13
14 PART 3 EXECUTION

15
16 3.1 GENERAL

- 17
18 A. Submit product data, shop drawings, samples, quality assurance submittals, quality control
19 submittals, and other items in accordance with the requirements of this section, applicable
20 sections in Division 1, and additional requirements of each individual Division 26
21 specification section.
22

23 3.2 SUBMITTAL ORGANIZATION

- 24
25 A. Provide a submittal cover page that lists at least the following:
26 1. Project name
27 2. Date
28 3. Name and address of architect
29 4. Name and address of engineer
30 5. Name, address and telephone number of electrical distributor
31 6. Name, address and telephone number of prime contractor
32 7. Name, address and telephone number of electrical contractor
33
34 B. Provide an index page listing all items submitted.
35
36 C. The contractor shall call to the attention of the engineer by letter, included in the submittal
37 after the index page, any instance in which the submittals are known to differ from the
38 requirements of the contract documents.
39
40 D. Organize all required items by specification section. All material for each specification
41 section shall be in one single pdf file. Material for multiple specification sections may be
42 combined into one file.
43
44 E. The material for each specification section shall be organized as follows:
45 1. The first page shall indicate the specification number and title and the name, address
46 and telephone number of the vendor or vendor's representative, if applicable.

1 2. Refer to the individual Division 26 specification sections for any required
2 organization of the submittal material within each submittal section.
3

4 F. Submit in accordance with the procedures described in specification section 01 33 00
5 Submittal Procedures.
6

7 G. Submittals not organized as described here may be rejected, without being reviewed, as
8 not complying with the provisions of the contract.
9

10 3.3 CLOSEOUT SUBMITTALS
11

12 A. Provide close-out submittals in accordance with the requirements of Division 1.
13

14 3.4 SCHEDULES
15

16 A. Division 26 Submittal Schedule: The Division 26 submittal shall include the following
17 items for each Division 26 specification section that is in the contract documents.
18 Coordinate this list with the submittal requirements listed in each specification section.
19 If an item has been omitted from either list but is included in the other, then provide that
20 item in the submittal. In case of conflicting or unclear requirements, contact the engineer.
21

22 B. The checklists begin on the following page.
23

Submittal Checklist – Lighting Group

Submit lighting submittals as one group electronically in PDF format. Incomplete submittals will be rejected.

Required submittals in the lighting group of the initial submittal package include but are not limited to the following. Always refer to the individual specification sections.

Specification Reference		Description
<input type="checkbox"/>	26 09 23.13 Motion Sensor Lighting Control	<input type="checkbox"/> Wall sensors <input type="checkbox"/> Ceiling sensors <input type="checkbox"/> Power packs & other components <input type="checkbox"/> Shop drawing – RCP <input type="checkbox"/> Shop drawing – wiring diagrams
<input type="checkbox"/>	26 50 00 Lighting	<input type="checkbox"/> Luminaires <input type="checkbox"/> LED drivers <input type="checkbox"/> Battery backup units <input type="checkbox"/> Automatic transfer devices for emergency lighting <input type="checkbox"/> Product warranty documentation

Submittal Checklist – General Electrical Group

Electrical submittals may be submitted in two separate groups: (1) Switchgear, panelboards, transformers, and electrical rooms. (2) Miscellaneous items. Submit electronically in PDF format. Incomplete submittals will be rejected.

Required submittals in the electrical group of the initial submittal package include but are not limited to the following. Always refer to the individual specification sections.

Specification Reference		Description
<input type="checkbox"/>	26 05 19 Low-Voltage Electrical Power Conductors and Cables	<input type="checkbox"/> Line voltage conductors
<input type="checkbox"/>	26 05 33.11 Raceways and Conduits for Electrical Systems	<input type="checkbox"/> Raceways and conduit <input type="checkbox"/> Fittings <input type="checkbox"/> Wireways <input type="checkbox"/> Supports for rooftop conduits <input type="checkbox"/> Labeling
<input type="checkbox"/>	26 05 33.13 Boxes and Fittings for Electrical Systems	<input type="checkbox"/> Fittings <input type="checkbox"/> Cover plates <input type="checkbox"/> Junction boxes <input type="checkbox"/> Outlet boxes <input type="checkbox"/> Pull boxes <input type="checkbox"/> Floor boxes <input type="checkbox"/> Extension rings
<input type="checkbox"/>	26 27 26 Wiring devices	<input type="checkbox"/> Devices <input type="checkbox"/> Device plates <input type="checkbox"/> Keys
<input type="checkbox"/>	26 28 13 Fuses	<input type="checkbox"/> Fuses
<input type="checkbox"/>	26 28 16 Enclosed Switches and Circuit Breakers	<input type="checkbox"/> Safety switches

END OF SECTION

1 SECTION 26 05 11

2
3 ELECTRICAL DEMOLITION

4
5
6 PART 1 GENERAL

7
8 1.1 SECTION INCLUDES

- 9
10 A. Electrical demolition.
11
12 B. Off-site removal of materials not reused.

13
14 1.2 RELATED SECTION

- 15
16 A. Section 26 00 00 - Electrical
17

18
19 PART 2 PRODUCTS

- 20
21 A. Not used.
22

23
24 PART 3 EXECUTION

25
26 3.1 EXAMINATION

- 27
28 A. Verify existing field measurements, circuiting arrangements, wiring and equipment served
29 in areas as shown on the Drawings. Adjust all circuiting, wiring and materials to be
30 provided as required by job conditions.
31
32 B. Verify abandoned wiring and equipment serving only abandoned facilities.
33
34 C. Drawings are based on casual field observation and existing record documents. Report
35 discrepancies to the Engineer before disturbing existing installation.
36
37 D. The Contractor accepts the existing conditions when beginning demolition.
38

39 3.2 PREPARATION

- 40
41 A. Disconnect electrical systems in walls, floors and ceilings as shown or required.
42
43 B. Coordinate utility service outage with the respective utility company and the Owner.
44
45 C. Provide temporary wiring and connections to maintain required existing systems in
46 service during construction.

1 D. When work must be performed on energized equipment or circuits, use personnel
2 experienced in such operations. Verify phasing on existing equipment and coordinate new
3 phasing before energizing revised service.
4

5 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK
6

7 A. Demolish and extend existing electrical work under provision of Division 1 and this
8 section.
9

10 B. Remove, relocate and extend existing installations to accommodate new construction as
11 required.
12

13 C. Remove abandoned wiring to the source of the supply.
14

15 D. Remove exposed abandoned conduit, including abandoned conduit above accessible
16 ceiling finishes. Cut conduit flush with walls, floors and patch surfaces.
17

18 E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit
19 servicing them is abandoned and removed. Provide blank cover for abandoned outlets
20 which are not removed in masonry construction.
21

22 F. Disconnect and remove electrical devices and equipment serving equipment that has been
23 removed.
24

25 G. Disconnect and remove abandoned lighting fixtures. Remove brackets, stems, hangers
26 and other accessories.
27

28 H. Repair adjacent construction and finishes damaged during demolition and extension
29 work.
30

31 I. Maintain access to existing electrical installations which remain active. Modify installation
32 or provide access panel as appropriate.
33

34 J. Extend existing installations using materials and methods compatible with existing
35 electrical installations or as specified.
36

37 K. Confirm with Owner or Architect regarding the handling and disposal/reuse of removed
38 material, equipment, devices, lights, etc.
39

40 3.4 REPAIR/RESTORATION
41

42 A. Clean and repair existing materials and equipment, in areas of revision, which remain or
43 which are to be reused.
44

45 B. Panelboards:

46 1. Clean exposed surfaces and check tightness of electrical connections.

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section includes conductors for power circuits, including terminations and connectors.

1.2 RELATED SECTIONS

- A. Section 26 00 00 – Electrical
- B. Section 26 00 90 – Electrical Submittal Procedures.
- C. Section 26 05 19.19 – Metal Clad Cable
- D. Section 26 08 11 – Testing of Electrical System

1.3 REFERENCES

- A. ANSI/UL 83 - Thermoplastic-Insulated Wires
- B. ICEA S-61-402 -Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- C. UL 44 - Rubber Insulated Wires and Cables
- D. National Electric Code
- E. UL 493 -Thermoplastic Insulated Underground Feeder and Branch Circuit Cables

1.4 SUBMITTALS

- A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 – Electrical Submittal Procedures.
- B. Product Data: Submit product data for the following:
 - 1. Conductors for power circuits
 - 2. Conductor terminations
 - 3. Connectors

- 1 C. Closeout Submittals: Closeout submittals shall include the following.
2 1. Submit letter certifying acceptable testing of all branch circuits.
3 2. Submit insulation test results for all new feeders installed in this project.
4

5 1.5 QUALITY ASSURANCE
6

- 7 A. General work practices for electrical construction shall be in accordance with NECA 1,
8 Standard Practices for Good Workmanship in Electrical Construction.
9
10 B. Regulatory Requirements: All products provided under this section shall be UL listed for
11 the intended use.
12

13 1.6 DELIVERY, STORAGE, AND HANDLING
14

- 15 A. Storage and Protection: Material shall be stored in a clean and dry location until
16 installation.
17

18
19 PART 2 PRODUCTS
20

21 2.1 MANUFACTURERS
22

- 23 A. Conductors shall be manufactured in the United States. Acceptable manufacturers are:
24 1. Encore Wire
25 2. Southwire
26 3. Cerro Wire
27
28 B. All other manufacturers shall require pre-approval in accordance with specification
29 section 26 00 00.
30

31 2.2 MATERIALS
32

- 33 A. All conductors shall be soft-drawn annealed copper.
34

35 2.3 MANUFACTURED UNITS
36

- 37 A. Manufactured conductors for power circuits:
38 1. All conductors for power circuits shall be rated for at least 600 volts.
39 2. The insulation for power conductors shall be type THWN-2 or THHN/THWN.
40 3. Conductors for power circuits shall be #12 AWG or larger.
41 4. Conductors for power circuits that are #12 AWG or #10 AWG shall be solid.
42 Conductors for power circuits that are #8 AWG and larger shall be stranded.
43 5. Conductors sized #6 AWG and smaller shall have factory colored insulation.
44
45 B. MC Cable: MC cable is allowed only for light fixture whips. Total length not to exceed
46 six feet.
47

- 1 C. Manufactured conductor terminations and connectors:
2 1. All accessory materials such as connectors, splice and tap fittings, and terminations
3 shall be of a type designed or intended and suitable for the use. They shall be
4 compatible with the conductor material.
5 2. Conductors shall be connected and terminated using suitable listed clamps, listed
6 pressure connectors, listed compression terminals or listed lugs and hardware of the
7 proper size for the application.
8 3. Only connection devices that require the complete removal of the conductor jacket or
9 insulation and result in a connection to the complete conductor surface area are
10 suitable for use. Insulation piercing type connectors shall not be used.
11 4. Splices and taps shall have a mechanical strength and insulation rating at least as that
12 of the conductors.
13 5. Compression systems shall include crimped die index and company logo for purposes
14 of inspection. Aluminum shall not be used for connection purposes.
15

16
17 PART 3 EXECUTION

18
19 3.1 SITE VERIFICATION OF CONDITIONS

- 20
21 A. Do not install the conductors until raceway system is complete.
22
23 B. Before installing the conductors for any power circuit or feeder, verify that the conductor
24 ampacity is at least as large as the rating of the overcurrent device protecting it. In the
25 event that the conductors would not be adequately protected, notify the engineer before
26 installation.
27

28 3.2 INSTALLATION

- 29
30 A. Wire Sizing: Provide conductors sized as indicated on drawings unless modified as
31 described below. Where conductor sizes have been omitted from drawings, base bid shall
32 include conductors with ampacity as least as large as the overcurrent protection device
33 protecting the conductors, or at least as large as the amp rating of the load being served,
34 whichever is greater. In such cases, notify the engineer before installation for size
35 verification.
36
37 B. Neutral Conductors: Provide a separate neutral conductor for each circuit. Multiple
38 circuits shall not share a common neutral. Neutral conductors shall be sized as large as
39 the phase conductors. Neutral conductors shall not be of a reduced size.
40
41 C. Number of Conductors per Conduit: When #12 AWG conductors are used on 20-amp
42 circuits, up to six current carrying conductors may be installed in a conduit run. When
43 #10 AWG conductors are used on 20-amp circuits, up to nine current carrying
44 conductors may be installed in a conduit run. Otherwise, there shall be no more than
45 three current-carrying conductors in each conduit run.
46

- 1 D. Installation in Raceways:
 2 1. Install all conductors for power circuits in raceways.
 3 2. All conductors to be installed in a raceway shall be pulled together. Use an approved
 4 wire pulling compound when pulling large conductors.
 5 3. Do not bend any conductor either permanently or temporarily during installation to
 6 radii less than four times the outer diameter of conductors.
 7 4. Do not exceed manufacturer's recommended values for maximum pulling tension.
 8 5. When installing conductors in existing conduit, the interior of the existing conduit
 9 shall be cleaned prior to the installation of the new conductors to insure that there is
 10 nothing that will damage the insulation.
 11 6. The pulling device shall be of a type that will not damage the raceway.

- 12 E. Terminations:
 13 1. Use pressure type lugs or connectors for terminations or splices of all stranded
 14 conductors. Use ring tongue type terminators on all control wiring. More than one
 15 conductor shall not be installed in any termination unless the termination is marked as
 16 suitable for more than one conductor. With the written approval of the engineer's
 17 office, an exception to this may be allowed for the installation of the lightning surge
 18 arrestors required in specification section 26 28 16, Enclosed Safety Switches and
 19 Circuit Breakers.
 20 2. Conductors shall not be supported solely by their terminations.
 21 3. Terminations shall be made such that the stripped length of the conductor is no longer
 22 than required for the terminal, lug, or connector.
 23 4. Conductive antioxidant shall be applied on all outdoor connections and connections
 24 in damp or wet locations.
 25

- 26 F. Splices:
 27 1. Conductor splices shall be kept to a minimum.
 28 2. Where splices are necessary, they shall be in a box or enclosure. Splices within a
 29 conduit run are not acceptable.
 30

- 31 G. Color Coding:
 32 1. Provide factory colored insulated conductors for #6 AWG and smaller.
 33 2. Color code larger insulated conductors with an approved field-applied tape 2" wide on
 34 each end of conductors.
 35 3. If existing wiring in renovation or addition work has a consistent color coding, then
 36 match the existing and note in record documents. Otherwise, colors shall be as
 37 follows:
 38

Line	208/120V	240/120V	480/277V
A	Black	Black	Brown
B	Red	Orange	Orange
C	Blue	Blue	Yellow
Neutral	White	White	Gray
Ground	Green	Green	Green
Isolated Ground	Green + Yellow	Green + Yellow	Green + Yellow

1 4. Switch leg shall be the same color as the un-switched phase wiring. Travelers, and
2 special systems as selected by the Contractor. Note in record drawings.
3

4 H. Identification: All conductors in a panelboard shall be identified by means of tags or tape.
5

6 3.3 SITE TESTS
7

8 A. Perform in accordance with manufacturer's printed testing procedures, applicable
9 industry standards, ANSI standards, IEEE standards, and NEMA standards. Provide
10 testing equipment in good working order and which complies with the applicable industry
11 standards and manufacturer's requirements. Submit a list of testing equipment used and
12 date of last calibration.
13

14 B. Insulation Test: The insulation of each feeder run and each branch circuit shall be tested.
15 The test shall be performed after the conductors have been pulled into the conduit and
16 after terminations have been added, but before final connections are made.
17

18 C. Test the following:
19 1. Phase to phase resistance
20 2. Phase to neutral resistance
21 3. Phase to ground resistance
22 4. Neutral to ground resistance
23

24 D. Branch Circuits: The insulation of branch circuits may be tested with a standard ohm
25 meter. Readings must indicate an open circuit to be acceptable. Submit letter documenting
26 that all circuits have been tested and are acceptable.
27

28 E. Feeders:
29 1. Perform megger tests on all new feeder runs.
30 2. Tests shall be performed in accordance with the Publication "Instruction Manual For
31 Megger Insulation Testers" by the Biddle Company.
32 3. Written documentation of the test results shall be submitted in accordance with
33 specification section 26 08 11 – Testing of Electrical System.
34
35

END OF SECTION

SECTION 26 05 19.19

METAL CLAD CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section includes the following:
 - 1. Metal Clad (Type MC) and Metal-Clad Interlocking Armor Ground Cable (Type MCIA).
 - 2. Wiring connections and terminations.
 - 3. Installation methods and procedures.

1.2 RELATED SECTIONS

- A. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
- B. 26 08 11 - Testing of Electrical System

1.3 REFERENCES

- A. UL 83 - Standard for Thermoplastic Insulated Wires and Cables
- B. UL 1569 - Standard for Metal Clad Cable
- C. NEC - NFPA 70, National Electrical Code 2014
- D. ASTM International.
- E. NET A ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

1.4 SUBMITTALS

- A. Product Data Submittals: Submit product data for each type of metal clad cable and fitting indicated.
- B. Quality Assurance/Control Submittals: Submit qualification data for testing agency.
- C. Closeout Submittals: Submit field quality-control test reports.

1 1.5 QUALIFICATIONS

- 2
- 3 A. Testing Agency Qualifications: An independent agency, with the experience and capability
- 4 to conduct the testing indicated, that is a member company of the International Electrical
- 5 Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by
- 6 OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- 7
- 8 B. Testing Agency's Field Supervisor: Person currently certified by the International
- 9 Electrical Testing Association or the National Institute for Certification in Engineering
- 10 Technologies to supervise on-site testing specified in Part 3.
- 11

12 1.6 REGULATORY REQUIREMENTS

- 13
- 14 A. Electrical equipment and materials shall be new and within one year of manufacture,
- 15 complying with the latest codes and standards. No used, re-built, refurbished and/or re-
- 16 manufactured electrical equipment and materials shall be furnished on this project.
- 17
- 18 B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA
- 19 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and
- 20 marked for intended use.
- 21
- 22 C. Metal-Clad Cable (MC) and Metal-Clad Interlocking Armor Ground Cable (MCI-A) shall
- 23 be manufactured in accordance with UL 1569 - Standard for Metal-Clad Cable for
- 24 installation in accordance with NFPA 70 (NEC).
- 25

26 1.7 DELIVERY, STORAGE, AND HANDLING

- 27
- 28 A. Deliver materials to site in unopened cartons or bundles as appropriate, clearly identified
- 29 with manufacturer's name, Underwriter's or other approved label, grade or identifying
- 30 number.
- 31
- 32

33 PART 2 - PRODUCTS

34 2.1 MANUFACTURERS

- 35
- 36
- 37 A. AFC Cable Systems, Inc. or approved equivalent.
- 38

39 2.2 ARMORED CABLE ASSEMBLY

- 40
- 41 A. Metal clad cable assemblies shall consist of 2 or more insulated current carrying copper
- 42 conductors and a green insulated copper ground conductor. The metal clad cable (or
- 43 armored cable assembly) shall be UL classified as a through-penetrating product (XHLY)
- 44 for use in one, two or three-hour through-penetration firestop systems (XHEZ). The
- 45 assembly shall be suitable for use in cable trays in accordance with the NEC.
- 46

- 1 B. Current-Carrying Conductors: Soft annealed copper in compliance with the latest edition
2 of ASTM B3 and/or B8; size 12 AWG through 6 AWG. A separate neutral conductor
3 shall be supplied with each phase conductor. Neutral conductor shall be oversized where
4 indicated on the plans.
5
- 6 C. Insulated Equipment Grounding Conductor: The equipment ground shall be a full-sized
7 insulated conductor with a protective cover, sized in accordance with Table 6.1 of UL
8 1569. The grounding conductor shall be soft-annealed copper in compliance with the
9 latest edition of ASTM B3 and/or B8.
10
- 11 D. Insulated Conductor: The insulated conductors shall be type THHN 90°C DRY with an
12 extruded polypropylene protective covering. The insulated conductors with protective
13 covering shall be manufactured and tested in accordance with UL 83 and UL 1569.
14 Insulated conductor identification shall be in accordance with Section 26 05 19.
15
- 16 E. Armor: A zinc coated galvanized steel armor shall be applied over the cabled wire
17 assembly with an interlock in compliance with Section 13 of UL 1569. Armor shall be
18 colored to identify the voltage and number of conductors.
19

20 2.3 FITTINGS

- 21
- 22 A. Fittings shall be UL listed and identified as MCI-A for such use with metal clad
23 interlocking armor ground.
24
- 25 B. Connectors shall be of steel or malleable iron and shall have saddle clamp to insure a tight
26 termination of MC or MCI-A cable to box.
27

28 PART 3 - EXECUTION

29 3.1 INSTALLATION

- 30
- 31
- 32
- 33 A. Scope: Provide metal clad cable for lighting and receptacle branch circuits, excluding
34 home runs. Provide metal clad cable for exterior circuits, including area lighting circuits,
35 generator feeders, and cooling tower circuits.
36
- 37 B. Interior Routing: Route metal clad cable runs parallel with or perpendicular to walls or
38 structural elements. Route horizontal runs level. Route vertical runs plumb. Rack groups
39 together neatly with both straight runs and bends parallel and uniformly spaced.
40
- 41 C. Supporting: Provide support for MC cable in accordance with NEC Article 330 or the
42 following, whichever is more stringent.
43 1. Properly support all cable at least every 72 ".

- 1 2. Use of cable tray: Basket, ladder rack, or ventilated cable tray may be utilized for
2 support of metal clad cabling. The sum of the cross-sectional areas of cables shall
3 not exceed the maximum allowable cable fill area allowed by NEC Article 392.
4 Ampacity of cables installed in cable tray shall meet the requirements of NEC
5 392.80.
- 6 3. In existing buildings, provide independently supported cable hangers. These
7 hangers are to be suitable for installation of MC cable.
- 8 4. In new buildings, provide a combination of cable tray and/or J cable hangers.
- 9 5. Individual metal clad cables hung from roof structure or structural ceiling shall be
10 supported by split-ring hangers and wrought-iron hanger rods. Where three or more
11 metal clad cables are suspended from the ceiling in parallel runs, use steel channels,
12 Unistrut or equal, hung from 1/2-inch (13 mm) rods to support the cables. The
13 cables on these channels shall be held in place with metal clad cable clamps designed
14 for the particular channel that is used.
- 15 6. Secure metal clad cable support racks to concrete walls and ceilings by means of
16 cast-in-place anchors; die- cast, rustproof alloy expansion shields; or cast flush
17 anchors. Wooden plugs, plastic inserts, or gunpowder driven inserts shall not be
18 used as a base to secure conduit supports.
- 19 7. Support metal clad cable immediately on each side of a bend and not more than
20 1 foot (300 mm) from an enclosure where a run of metal clad cable ends.
- 21
- 22 D. Securing: Securely fasten metal clad cables in place at intervals of not more than six feet
23 with suitable clamps or fasteners of approved type.
- 24
- 25 E. Bends: Provide bends no less than seven times the diameter of the metallic sheath.
- 26
- 27 F. Clearances: Maintain clearances described below.
- 28 1. Where metal clad cable is installed parallel to framing members, such as studs, joist,
29 or rafters, support the cable so that the nearest outside surface of the cable is at least
30 1-1/4 inches (31 mm) from the nearest edge of the framing member. Where this
31 distance cannot be maintained, protect the cable by a steel plate, sleeve, or equivalent
32 that is at least 1/16-inch thick.
- 33 2. Maintain at least 6-inch clearance between metal clad cables and other piping
34 systems.
- 35 3. Maintain 12-inch (300 mm) clearance between metal clad cables and heat sources
36 such as flues, steam pipes, and heating appliances.
- 37 4. No metal clad cable shall be fastened to other conduits or pipes or installed so as to
38 prevent the ready removal of other pipes or ducts for repairs.
- 39
- 40 G. Fittings: Follow manufacturer's instructions for cable preparation for installation of
41 fittings. Cleanly cut the cable end with metal clad cable rotary cutting tool to ensure flush
42 seating of the cable into the fitting. Properly torque fitting securement screws.
- 43
- 44 H. Splices and Terminations: Make splices at junction boxes with an approved, insulated, live
45 spring type connector such as those manufactured by Scotchlock, 3M or Ideal.
- 46

- 1 I. Conductors in Enclosures: Provide neat and workmanlike installation with conductors
2 tied with nylon wire ties in terminal cabinets, gutters and similar locations.
3
- 4 J. Terminating metal clad cables into panelboards:
5 1. Provide a junction box within plenum space with sweep elbows down to panelboard,
6 or
7 2. Use a ladder tray mounted vertically above the panelboard. Strap cables to rungs
8 and install cover on cable tray.
9
- 10 K. Identification: Identify all wiring with permanent wire labels, using alphanumeric
11 designations. Terminations and splices shall be identically labeled for the same wire (i.e.
12 common conductors terminated in multiple locations). Wire labels shall agree with the
13 circuit designations on the Construction Drawings. Identify conductors in outlets, pull
14 boxes and similar locations where conductors are accessible with printed plastic adhesive
15 tapes to show circuit numbers. Wrap tapes at least two turns around conductor. Mark
16 panel identification number with felt tip pen on cloth or plastic tag and attach to entering
17 conductors with nylon string.
18

19 3.2 SITE TESTS, INSPECTION
20

- 21 A. All fittings and locknuts shall be re-examined for tightness. A continuity test is to be
22 performed at each connection as a final means of inspection for tightness of joints.
23
- 24 B. Perform site tests in accordance with sections 26 08 11 and 26 05 19.
25
- 26 C. Perform field tests in conformance with the National Electrical Testing Association
27 (NETA) Standards.
28

29 END OF SECTION

SECTION 26 05 33.11

RACEWAYS AND CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Electrical raceway and conduit systems.

1.3 RELATED SECTIONS

- A. Divisions 27 and 28 - Communications and Security
- B. Section 26 00 00 - Electrical
- C. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

1.4 REFERENCES

- A. ANSI/ANSI C80.1 - Zinc-Coated Rigid Steel Conduit
- B. ANSI/ANSI C80.4 - Zinc Coated Electrical Metallic Tubing
- C. ANSI/ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
- D. ANSI/UL 1 - Flexible Metal Conduit
- E. ANSI/UL 5 - Surface Metal Raceways and Fittings
- F. ANSI/UL 651 - Rigid Nonmetallic Conduit
- G. ANSI/UL 797 - Electrical Metallic Tubing
- H. ANSI/UL 870 - Safety Standard for Wireways, Auxiliary Gutters and Associated Fittings
- I. ETL PVC-001 - PVC-Coated Rigid Steel Conduit
- J. NEMA TC2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80) and Fittings

1 K. NEMA TC3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing

2
3 L. UL 6 - Rigid Metal Electrical Conduit

4
5 M. UL 360 - Liquid tight Flexible Steel Conduit

6
7 N. UL 467 - Electrical Grounding and Bonding Equipment

8
9 1.5 SUBMITTALS

10
11 A. Submittals required in this section shall conform to and be submitted in accordance with
12 the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.
13 Included in this section are all raceways and conduit, fittings, wireways, supports for
14 conduit on roof, and labeling used. Provide samples upon specific request. U.L. labels
15 affixed to each item of material.

16
17 1.6 DESCRIPTION OF WORK

18
19 A. The use of the various raceway systems is restricted to the types and other restrictions of
20 the NEC and the local codes. Use of all such systems shall be verified with the local code
21 authority before use. In the case of questionable or denied use, the contractor shall be
22 required to use a raceway system permitted by the local code at no additional cost.

23
24 B. Where conduits pass through beams, outside walls, fire rated walls, or structural members,
25 galvanized steel pipe sleeves shall be provided. The size of these sleeves shall be such as
26 to permit readily the subsequent insertion of conduit of the proper size with adequate
27 clearance for movement due to expansion and contraction. Where conduits pass through
28 outside walls, the inside diameter of the galvanized iron pipe sleeves shall be at least 1/2"
29 greater than the outside diameter of the service pipe. After the conduits are installed, fill
30 the annular space between the conduit and its sleeve with a mastic or caulk. Use packing
31 as required to accomplish this. At fire rated wall penetrations, use fire barrier.

32
33 C. Grounding: The installation shall comply with all NEC grounding requirements.

34
35 D. Exposed surface raceways are specifically not permitted, in new construction. Where a
36 raceway is required, in existing construction, it shall be solid, without knockouts, with
37 hinged cover, placed so that cover is gravity closed.

38
39 E. Install complete, separate conduit systems for all electrical systems on this project to
40 include, but not limited to include the following.

- 41 1. Electrical power and lighting feeders
42 2. Electrical power and lighting circuits
43 3. Control wiring furnished by this contractor
44 4. Emergency and standby power and lighting circuits
45 5. Communication systems
46 6. Other electrical systems
47

- 1 F. Branch circuits shall not be installed in or under the ground floor slab and will not be
2 accepted. The only exceptions being circuits and locations specifically required on the
3 drawings to be in or under the floor slab.
4
- 5 G. Aluminum conduit shall not be installed in direct contact with concrete or masonry
6 construction.
7

8 PART 2 PRODUCTS

10 2.1 CONDUITS AND FITTINGS

12 2.1.1 MINIMUM SIZES

- 14 A. Do not use conduit sized less than 3/4 inch steel, 3/4 inch for PVC conduit, 3/8 inch
15 flexible metal conduit, for lengths not to exceed 72 inches supplying light fixtures.
16

17 2.1.2 RIGID METAL CONDUIT. (RSC) (RAC) (IMC)

- 19 A. Hot-dipped galvanized rigid steel (RSC), Intermediate Metallic (IMC) with zinc-coated
20 threads and an outer coating of zinc chromate, Rigid Aluminum (RAC) accepted.
21

22 B. Fittings:

- 23 1. Malleable iron, either cadmium plated or hot-dipped galvanized. Die cast zinc.
24 Aluminum for aluminum conduit. Insulated at box entrances.
25 2. Use of set screw or bolt-on connectors and couplings is not accepted.
26 3. Use deflection and expansion couplings with bonding jumpers at all expansion joints
27 where required. Steel Clamps.
28

- 29 C. Usage: Where exposed on interior and exterior of buildings including roof. All elbows of
30 PVC conduit. Within or penetrating concrete slabs (RSC only).
31

32 2.1.3 PVC COATED RIGID METAL CONDUIT

- 34 A. NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride
35 (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL
36 6 and ETL PVC-001. The PVC coated galvanized rigid conduit must be ETL Verified to
37 the Intertek ETL SEMKO High Temperature H2O PVC Coating Adhesion Test
38 Procedure for 200 hours.
39

40 B. Fittings

- 41 1. Malleable iron. Steel.
42 2. Use fittings listed and labeled as complying with UL514B.
43 3. Exterior Coating: Polyvinyl Chloride (PVC), minimum thickness of 40 mils.
44 4. Interior Coating: Urethane, minimum thickness of 2 mils.
45

- 46 C. Usage: Damp or wet locations. The stub-up from below grade to above grade

- 1 2.1.4 ELECTRICAL METALLIC TUBING (EMT)
2
3 A. Galvanized Electrical Steel, Galvanized Thin Wall, or Aluminum Tubing
4
5 B. Fittings: Set screw or compression type. Indenter type is not accepted. Die cast zinc.
6 Pressure cast. Malleable iron. Steel. Steel Clamps. To be insulated at box entrances.
7
8 C. Usage: Concealed in interior walls and ceiling spaces. Exposed only in interior mechanical,
9 electrical rooms, and equipment rooms. Gyms, activity spaces, stages as directed, above
10 10'-0" A.F.F. where exposed. Installation in or under the floor slab will not be accepted.
11
- 12 2.1.5 RIGID NONMETALLIC CONDUIT (RNC)
13
14 A. Schedule 40 heavy wall polyvinylchloride, high impact resistant.
15
16 B. Fittings: Solvent weld socket type
17
18 C. Usage: Underground, under slabs, all bends to be rigid steel. Do not penetrate slab with
19 PVC. Do not use above slabs, above grade, or exposed. Use long sweep rigid steel 90's
20 and rigid steel from 90's to and above grade.
21
- 22 2.1.6 FLEXIBLE METAL CONDUIT (FMC)
23
24 A. Spiral-wound, square-locked aluminum. Spiral-wound, square locked, hot-dipped
25 galvanized steel.
26
27 B. Fittings: Cadmium plated two-screw, double-clamp malleable iron. Hot-dipped
28 galvanized two-screw, double-clamp malleable iron. Malleable. Pressure cast. Steel cast.
29 Steel/Malleable for 90°. Zinc coated, aluminum.
30
31 C. Usage:
32 1. May be used for light fixture whips.
33 2. May be used for final equipment connections, such as transformers, motors and
34 HVAC equipment.
35 3. Total length not to exceed 72" above ceiling, 48" exposed below ceiling.
36 4. Exposed only in interior mechanical or electrical rooms.
37 5. For renovation work, may be used in existing walls only under the following
38 conditions:
39 a. The use of EMT or rigid conduit is not feasible.
40 b. Written permission has been obtained from the engineer.
41 c. Surface mounted conduit is not desired.
42 6. Installation in or under the floor slab will not be accepted.
43
- 44 2.1.7 LIQUID-TIGHT FLEXIBLE METAL CONDUIT (LFC)
45
46 A. Spiral-wound, square-locked, hot-dipped galvanized steel strip plus a bonded outer jacket
47 of PVC.

- 1 B. Fittings:
- 2 1. Cadmium plated, compression type, malleable iron with insulated throat. Hot-dipped
- 3 galvanized, compression type, malleable iron with insulated throat.
- 4 2. Aluminum - Copper free (1% or less)
- 5
- 6 C. Usage:
- 7 1. Exterior equipment - 5' 0" Maximum length
- 8 2. Kitchen equipment - 4' 0" Maximum length
- 9

10 2.1.8 ACCEPTABLE MANUFACTURERS

11

- 12 A. Metallic Conduits: Pittsburgh, Alflex, AFC, Wheatland, Allied, Omega, Spang, and
- 13 Nepco.
- 14
- 15 B. Nonmetallic Conduits: Carlon, Sedco, and Can-Tex.
- 16
- 17 C. PVC Coated Metallic Conduits: Plasti-Bond, Perma-Cote, and KorKap.
- 18
- 19 D. Fittings: Madison, Hubbell, Raco, Regal, Appleton, Thomas & Betts, Steel City, and ECN
- 20 Korns.
- 21
- 22 E. Others: As listed with products.
- 23

24 2.2 WIREWAYS

25

- 26 A. Not less than 16 gauge sheet steel. Cross section dimensions not less than 4 inches by 4
- 27 inches, or as noted. ANSI gray epoxy paint over rust-inhibiting prime coat. NEMA rated.
- 28 Large enclosed surface metal raceway used where conduit is not accessible, or use of
- 29 conduit is not feasible.
- 30
- 31 B. Manufacturers: Square D., Hoffman
- 32

33 2.3 POWER/DATA RACEWAYS

34

- 35 A. Wiremold AL4320 series, two compartment, with isolated ground duplex receptacles and
- 36 data devices as noted on drawings. Provide all required mounting accessories. Serve
- 37 raceways from flush outlet boxes mounted behind raceway as required and as directed.
- 38
- 39

40 PART 3 EXECUTION

41

42 3.1 PREPARATION

43

- 44 A. Place sleeves in the cavities of walls and floor slabs for the free passage of conduits.
- 45
- 46 B. Set sleeves in place a sufficient time ahead of concrete placement so as not to delay the
- 47 work.

1 C. Apply caulking for sleeves through floors and through exterior walls.

2
3 D. Be sure that plugs or caps are installed before concrete placement begins.

4
5 3.2 INSTALLATION

6
7 3.2.1 CONDUITS

8
9 A. Metallic conduits must be continuous between enclosures such as outlet, junction and
10 pull boxes, panels, cabinets, motor control centers, etc. The conduit must enter and be
11 secured to enclosures so that each system is electrically continuous throughout. Where
12 knockouts are used, provide double locknuts, one on each side. At conduit terminations,
13 provide insulated bushings for conductor protection. Where conduits terminate in
14 equipment having a ground bus, such as in switchgear, and panelboards, provide conduit
15 with an insulated grounding bushing.

16
17 B. It is intended to reuse the existing conduits in existing construction, if they prove to be
18 adequate in size and integrity.

19
20 C. Install conduit and tubing products as indicated, in accordance with applicable
21 requirements of NEC and the NECA "Standard of Installation", and in accordance with
22 recognized industry practices to ensure that products serve the intended function.

23
24 D. Cap open ends of raceways until conductors are installed.

25
26 E. Wherever possible and unless otherwise indicated on the drawings, install conduit
27 concealed in walls, partitions and above the ceiling. Install conduit exposed in ceiling area
28 at the structure in electrical rooms, mechanical rooms and other rooms where ceilings are
29 not present or scheduled.

30
31 F. In mechanical rooms install conduit to equipment not adjacent to walls, by dropping
32 conduits exposed from overhead.

33
34 G. Install conduits parallel and supported on Unistrut or equal trapezes and anchored with
35 split ring hangers, conduit straps or other devices specifically designed for the purpose.
36 Wire ties are not permitted. Do not support conduit from ceiling system supports.

37
38 H. Installation of the PVC Coated Conduit System shall be performed in accordance with
39 the Manufacturer's Installation Manual. All clamping, cutting, threading, bending, and
40 assembly instructions listed in the manufacturer's installation guide should be followed
41 To assure correct installation, the installer shall be certified by Manufacturer to install
42 coated conduit.

43
44 I. Liquid-tight flexible metal conduit on the roof shall be securely fastened in place by an
45 approved means within 12 inches of each box, cabinet, conduit body, or other conduit
46 termination, and shall be supported and secured at intervals not to exceed 4.5 feet.
47 Flexible conduit cannot lay on roof.

- 1 J. Have rigid nonmetallic conduit adequately solvent welded at joints to form a tight,
2 waterproof connection. Run green ground wire in all PVC conduit and extend to ground
3 bus.
4
- 5 K. Run concealed conduit as directly and with the largest radius bends as possible. Run
6 exposed conduit parallel or at right angles to building or other construction lines in a neat
7 and orderly manner. Conceal conduit in finished areas. Branch circuits installed in or
8 under slabs on grade will not be accepted unless noted on drawings. Branch circuits shall
9 be installed below floor slabs above first floor.
10
- 11 L. Install each entire conduit system complete before pulling in any conductors. Clean the
12 interior of every run of conduit before pulling in conductors. See Section 26 05 19
13 Conductors for additional requirements for installation of conductors in raceways.
14
- 15 M. Conduit and raceways shall be suspended from building structure, not from ceiling
16 suspension system.
17
- 18 N. Make bends with standard ells or conduit bent in accordance with the NEC. Make field
19 bends using equipment designed for the particular conduit material and size involved.
20 Bends must be free from dents or flattening. Use no more than the equivalent of four 90-
21 degree bends in any run between terminals and cabinets, or between outlets and junction
22 boxes or pull boxes.
23
- 24 O. Securely fasten and support all conduit runs. Provide required clamps,
25 straps, clips, hangers and brackets. Raceways run in joists shall be secured to joists with
26 clamps at 20'0" maximum spacing. Raceways run parallel to joists shall be supported by
27 caddy clips (1 inch or smaller) or in unistrut/threaded rods/beam clamps trapeze at 15'-0"
28 centers. Raceways run perpendicular to bottom of joists shall be secured with individual
29 conduit hangers at 10'-0" maximum spacing or unistrut/threaded rods/beam clamps at
30 15'-0" maximum centers. Raceways supported by straps at walls shall be supported per
31 NEC. Support all raceways within one foot of each box, cabinet, disconnect, bend or
32 other raceway termination.
33
- 34 P. Run flexible conduit to all recessed fluorescent fixtures in accessible ceilings. Do not use
35 more than 4 flexible metal conduits per junction box to supply light fixtures in a location.
36 Do not supply a fixture from another with any Raceway or FMC. Suspend junction boxes
37 and conduits from high roofs with hangers and trapeze.
38
- 39 Q. Provide two spare 1 inch conduits stubbed into attic space at flush mounted electrical
40 cabinets.
41
- 42 R. Provide a Greenlee #431 or equal (240 lbs) nylon pulling line in conduits in which wiring
43 is not installed under this work, such as telephone, signal, and similar systems. Identify
44 both ends of the line by means of labels or tags reading "Pulling Line".
45

- 1 S. Use expansion-deflection fittings on conduits 2 inches and larger crossing structural
2 expansion joints and on exposed conduit runs where necessary. Provide bonding jumpers
3 across fittings in metal raceway systems.
4
- 5 T. Openings around electrical penetrations of fire resistance rated walls, partitions, floors or
6 ceilings shall be made using approved methods so as to maintain the original fire
7 resistance rating. See NEC 300-21.
8

9 3.2.2 WIREWAYS

- 10
11 A. Install wireways, where noted or required. Field apply a 90 percent grey zinc paint coating
12 over cuts or scratches before any other finish is applied.
13

14 3.2.3 SURFACE RACEWAYS

- 15
16 A. Install surface raceways, where noted or required. At metallic raceways, field apply a 90
17 percent zinc paint coating to cuts or scratches before any other finish is applied.
18

19 3.2.4 COMMUNICATION SYSTEMS

- 20
21 A. This contractor shall provide all raceways and conduits for all communication systems
22 shown and/or required on the drawings. Communication Systems may include but are
23 not limited to fire alarms, intercoms, telephones, television, security, computer data,
24 antenna and media management.
25
- 26 B. Raceways and conduit requirements shall be coordinated by this contractor with each
27 Communication Systems Contractor and the general contractor.
28
- 29 C. See Specification Divisions 27 and 28 for additional requirements.
30

31 3.3 COLOR CODING

- 32
33 A. Provide color bands approximately two inches wide, applied at 10 foot centers and at pull
34 box locations.
35
- 36 B. Color Codes:
- | | | |
|----|----------------------|--------|
| 37 | 1. Fire Alarm System | Red |
| 38 | 2. Voice/Data | Blue |
| 39 | 3. Security System | Green |
| 40 | 4. Media Management | Yellow |
| 41 | 5. CATV/MATV | Black |
- 42
43

END OF SECTION

SECTION 26 05 33.13

BOXES AND FITTINGS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Outlet boxes
- B. Junction boxes
- C. Pull and splice boxes

1.3 RELATED SECTIONS

- A. Divisions 27 and 28 - Communication Systems
- B. Section 26 00 00 - Electrical

1.4 REFERENCES

- A. ANSI/NEMA Publication No. OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers and Box Supports, and Cast Aluminum Covers.
- B. ANSI/UL 514 - Electrical Outlet Boxes and Fittings.
- C. NEC 370-23(d)

1.5 DESCRIPTION OF WORK

- A. The extent of electrical box and electrical fitting work is indicated by drawings and the requirements of this section.
- B. The types of electrical boxes and fittings required for the project include the following:
 - 1. Outlet boxes
 - 2. Junction boxes
 - 3. Pull boxes
 - 4. Conduit bodies

1 1.6 SUBMITTALS

- 2
- 3 A. Submittals required in this section shall conform to and be submitted in accordance with
- 4 the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.
- 5
- 6 B. Include cut sheets of fittings, cover plates, junction boxes, outlet boxes, pull boxes, floor
- 7 boxes and extension rings. Provide samples upon specific request.
- 8
- 9

10 PART 2 PRODUCTS

11

12 2.1 OUTLET BOXES

13

14 A. Flush Device Boxes

- 15 1. Galvanized steel boxes, with extension rings as required. Use 1½ inch deep by 4
- 16 inches long, square or rectangular, unless otherwise noted on drawings.
- 17 2. Provide galvanized steel interior outlet wiring boxes of the type, shape and size,
- 18 including depth of box, to suit each respective location and installation; constructed
- 19 with stamped knockouts in back and sides, and with threaded holes with screws for
- 20 securing box covers or wiring devices.
- 21 3. In boxes with multiple switches, where the voltage between adjacent switches
- 22 exceeds 300 volts, provide an enclosure equipped with identified, securely installed
- 23 barriers between adjacent devices.
- 24

25 B. Exposed Device Boxes: Use FS or FD cast boxes with threaded hubs.

26

27 C. Lighting Fixture Boxes: Galvanized steel with fixture stud supports and attachments to

28 properly support ceiling and bracket-type lighting fixtures. Provide galvanized steel

29 interior outlet wiring boxes of the type, shape and size, including depth of box, to suit

30 each respective location and installation; constructed with stamped knockouts in back

31 and sides and with threaded holes with screws for securing box covers or wiring devices.

32 1½ inch deep by 4 inches wide octagonal box, unless otherwise noted.

33

34 D. Voice & Data Outlet: Provide back boxes at each voice and data outlet. Communications

35 wiring, device and plate to be provided by communications contractor. See Specification

36 Divisions 27 and 28 for additional requirements.

37

38 E. Masonry Boxes: Galvanized steel with gang capacity and extension ring covers to match

39 the number of devices installed.

40

41 2.2 JUNCTION, PULL AND SPLICE BOXES

42

43 A. Galvanized steel boxes conforming to NEC Article 370.

44

45 B. Use NEMA 1 type boxes at least 4 inches deep, interior spaces.

46

47 C. Use NEMA 3R type boxes at least 4 inches deep, exterior spaces.

1 D. Use NEMA 4 cast iron type with external recessed flanged cover when cast in concrete.

2
3 2.3 MANUFACTURERS

4
5 A. Appleton

6
7 B. Hoffman

8
9 C. Hubbell

10
11 D. Keystone

12
13 E. Lew

14
15 F. Raceway Components

16
17 G. RACO

18
19 H. Stahlin

20
21 I. Steel City

22
23 J. Walker

24
25
26 PART 3 EXECUTION

27
28 3.1 OUTLET BOXES

29
30 3.1.1 GENERAL

31
32 A. Provide all standard boxes, pull junction, wiring device and/or splice boxes for all systems
33 in walls and slabs.

34
35 B. All low voltage systems in attic or crawl spaces specified in Division 23 are not included.

36
37 C. At all ceiling-mounted receptacle and luminaire (exit light, pendants, linear direct/indirect,
38 etc.) locations, provide a heavy duty dual bar hanger with ceiling ties to support the back
39 box. Provide Cooper Industries BA50F or approved equal with appropriate back box for
40 the application.

41
42 3.1.2 FLUSH BOXES

43
44 A. Mount all outlet boxes flush within 1/4 inch of the finished wall or ceiling line unless
45 otherwise indicated. Provide knockout closures to cap unused knock out holes where
46 knock out holes have been removed. Install outlets flush with finish walls or ceiling
47 surfaces for concealed wiring.

- 1 B. Provide galvanized steel extension rings where required to extend the box forward in
2 conformance to NEC requirements. Attach ring with at least two machine screws. Install
3 electrical boxes and fittings in compliance with NEC requirements and in accordance
4 with the manufacturer's written instructions and with recognized industry practices to
5 ensure that the boxes and fittings serve the intended purposes.
6
7 C. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring. Install
8 blank cover plates, painted to match surrounding, at pull boxes, junction boxes and all
9 others to which no fixture or device is to be attached.
10
11 D. Securely fasten outlet boxes in position using clips or other suitable means. Secure boxes
12 rigidly to the substrate upon which they are being mounted. Solidly embed boxes in
13 concrete or masonry. Boxes shall not be permitted to move laterally, or to be supported
14 only by EMT or conduit.
15
16 E. Provide plaster rings for all boxes in plastered walls and ceilings.
17
18 F. Where more than one switch occurs at the same location, use multiple gang outlet boxes
19 covered by a single plate. Separate switches ganged in one box by a grounded metal barrier
20 where system voltage exceeds 150 volts to ground. Fittings shall be approved for
21 grounding purposes or shall be jumpered with a copper grounding conductor of
22 appropriate ampacity. Leave terminations of such jumpers exposed. Use masonry type
23 boxes with square corners in unplastered tile walls to allow tile to be sawed out neatly
24 around box. Plates shall cover any cracks between box and tile. Use oversize plates where
25 necessary.
26

27 3.1.3 LIGHTING FIXTURE BOXES

28

- 29 A. Do not install boxes for suspended lighting fixtures which are attached to and supported
30 from suspended ceilings. Coordinate all lighting fixture outlets with mechanical and
31 architectural equipment and elements to eliminate conflicts and provide a workable neat
32 installation. Install approved 3/8" fixture studs in outlets from which lights are
33 suspended, fastened through from back of box. Anchor outlet boxes and particularly
34 those supporting fixtures, securely in place in an approved manner. Support outlet boxes
35 and fixtures from building structures, not from ceiling material. Provide yokes, channels,
36 studs or other supporting materials as required.
37
38 B. At all exit luminaires installed in grid ceilings (T-grid), provide a Cooper Industries BA50F
39 or approved equal.
40

41 3.1.4 WALL MOUNTING HEIGHT

42

- 43 A. Mounting height of a wall-mounted outlet box means the height from finished floor to
44 bottom of box.
45
46 B. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical
47 pattern with all tops at the same elevation.

1 C. Remove and relocate any outlet box placed in an unsuitable location.

2
3 3.1.5 BACK-TO-BACK BOXES

4
5 A. Do not connect outlet boxes back to back unless prior approval from Engineer is
6 obtained.

7
8 B. Where such a connection is necessary to complete a particular installation, fill the voids
9 around the wire between the boxes with sound insulating material.

10
11 3.1.6 BOX OPENINGS

12
13 A. Provide only the openings necessary to accommodate the conduits at each individual
14 location.

15
16 3.2 JUNCTION, PULL AND SPLICE BOXES

17
18 3.2.1 INSTALLATION

19
20 A. Install boxes as required to facilitate cable installation in raceway systems.

21
22 B. Provide boxes in conduit runs of more than 100 feet or as required in Division 26.

23
24 C. Locate boxes strategically and make them of such shape to permit easy pulling of wire or
25 cables.

26
27 D. Locate exposed pull or junction boxes subject to the owner's representative's approval.
28 Protect boxes in such a manner as to prevent foreign material, such as plaster, from
29 entering boxes. Boxes shall be thoroughly cleaned of foreign materials before pulling
30 conductors.

31
32 E. Install and support boxes per NEC 314-23 as required and as directed.

33
34 3.2.2 COVERS

35
36 A. Provide boxes so that covers are readily accessible and easily removable after completion
37 of the installation.

38
39 B. Include suitable access doors for boxes above suspended ceilings.

40
41 C. Select a practical size for each box and cover.

42
43 D. Label covers with permanent "black" felt-tip marker. Circuit numbers shall be provided
44 on power covers.

45
46 E. Spray paint fire alarm covers red.

1 3.3 LOCATION OF BOXES
2

- 3 A. The approximate location of boxes for switches, light outlets, power outlets, etc. is
4 indicated on the plans. These drawings, however, may not give complete and accurate
5 information in regard to locations of such items. The exact locations shall be determined
6 by reference to the general building plans and by actual measurements during
7 construction of the building, subject to the Architect's approval.
8
- 9 B. The Owner's representative reserves the right to make reasonable changes, up to six feet,
10 in the indicated locations before work is roughed in, without additional charge.
11
- 12 C. Unless otherwise shown or specified, install boxes for switches 44" and receptacles 18"
13 above finished floor. Verify all door swings with the drawings and schedules and locate
14 switches and pull stations, unless specifically noted otherwise, on the strike side of the
15 door. If switch is indicated on hinged side of door, verify location with the Owners
16 Representative.
17
- 18 D. Where shown near doors, install wall switches shall be ganged in multiples as required
19 covered by a single multigang cover plate. Where convenience outlets, telephone outlets,
20 or data processing equipment outlets are near each other, outlet boxes shall be joined or
21 otherwise placed so that they are all the same level. Device plates shall match for all
22 outlets.
23

24
END OF SECTION

SECTION 26 09 23.13

MOTION SENSOR LIGHTING CONTROLS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 SECTION INCLUDES

- A. This section includes the provision of a lighting control system for the automatic deactivation of indoor lighting, except for lighting intended for 24-hour operation.
- B. This section does not include controls for theater and stage equipment.
- C. This section does not include dimming for daylight harvesting.

1.2 REFERENCES

- A. NEMA Guide Publication WD 7-2011 Occupancy Motion Sensors

1.3 DEFINITIONS

- A. Motion Sensor – A sensor that detects when an occupant is in a space. This sensor can be wired or configured to be an occupancy sensor or vacancy sensor.
- B. Occupancy Sensor – A motion sensor designed to automatically turn the lighting in a space “on” when an occupant enters the space and automatically turn the lighting in a space “off” after the occupant is no longer present or detected for a predetermined length of time.
- C. Vacancy Sensor – A motion sensor designed to require an occupant to manually turn the lighting in a space “on” and automatically turn the lighting in a space “off” after the occupant is no longer present or detected for a predetermined length of time.
- D. Dual Technology Sensor – A motion sensor with both infrared and ultrasonic technologies or both infrared and microphonic technologies.

1.4 SYSTEM DESCRIPTION

1.4.1 DESIGN REQUIREMENTS

- A. Occupancy Sensor System – The system shall consist of a motion sensor, power pack, control wiring and shall work with standard switches.

- 1 B. Vacancy Sensor System – The system shall consist of a motion sensor, power pack,
2 control wiring and shall require special low-voltage switches.
3
4 C. The system shall utilize motion sensors and related devices to automatically control the
5 lighting to meet the intent of the International Energy Conservation Code (IECC).
6
7 D. Ceiling sensors shall be low voltage sensors.
8
9 E. Wall switch sensors shall be suitable for control of 120-volt or 277-volt lighting.
10
11 F. Toilets are the only place where wall switch sensors are allowed.
12
13 G. Provide dual technology sensors in all restrooms.
14

15 1.4.2 PERFORMANCE REQUIREMENTS

- 16
17 A. Occupancy Sensor System - The system shall be designed to turn the lighting in the space
18 "on" immediately upon sensing a room occupant. The system shall turn the lighting in
19 the space "off" if no occupant is sensed for a pre-determined time period.
20
21 B. Where occupancy sensors are installed, the initial trigger motion detection may be based
22 on either major motion or minor motion. The maintained motion detection shall be based
23 on minor motion.
24
25 C. For corridor, stairwell, and vestibule occupancy sensors, the initial trigger motion
26 detection and the maintained motion detection shall be based on major motion.
27
28 D. Vacancy Sensor System - The system shall be designed to turn the lighting in the space
29 "on" when manually turned on and to turn the lighting in the space "off" if no room
30 occupant is sensed for a pre-determined time period. Vacancy sensor systems shall be
31 required to meet IECC 2012 and to be installed in all spaces where sensor symbol is
32 shown except for the following. Occupancy sensors shall be allowed in the following
33 spaces:
34 1. Corridors, stairwells, vestibules, lobbies
35 2. Gang (multi-toilet) restrooms
36 3. Cafeteria
37 4. Gymnasium
38 5. Library
39 6. Band Hall
40 7. Choir
41 8. Weight room
42 9. Science Lab
43 10. Kitchen
44 11. Serving line
45 12. Intervening spaces
46

- 1 E. Where vacancy sensors are installed, the maintained motion detection shall be based on
2 minor motion.
3
4 F. All power packs and wall switch sensors shall utilize zero-crossing circuitry.
5
6 G. Coverage areas for major motion and minor motion shall be determined in accordance
7 with Section 3 of NEMA WD 7 Guide.
8
9 H. All sensors to be set to 20 minute time delay and adjusted to maximum sensitivity, unless
10 otherwise noted on the drawings.
11

12 1.5 SUBMITTALS

13
14 1.5.1 PRODUCT DATA

- 15
16 A. Submit product data for all components and accessories of the motion sensor lighting
17 control system.
18
19 B. Brand name products, other than those specified as acceptable manufacturers in Part 2
20 of this specification, shall clearly indicate the original equipment manufacturer.
21
22 C. Product data for sensors shall clearly indicate coverage areas for major motion and minor
23 motion determined in accordance with the testing procedures of NEMA WD 7 Guide.
24

25 1.5.2 SHOP DRAWINGS

- 26
27 A. Submit shop drawings of the reflected ceiling plan drawings showing specific locations of
28 all power packs, photo eyes, programmable / low-voltage switches and motion sensors
29 for lighting control including lines delineating sensor effective range, with and without
30 furniture system partitions, sensor type, sensor mounting, and other pertinent data to
31 allow evaluation of the proposed system.
32
33 B. Submit wiring diagrams for motion sensors, related control units, and override switches.
34

35 1.5.3 CLOSEOUT SUBMITTALS

- 36
37 A. Operating and Maintenance Manuals: Provide 2 complete sets of operating, maintenance,
38 and adjustment instructions and other information necessary for proper operation of the
39 motion sensor lighting controls. These document shall be included as part of the project
40 operating and maintenance manuals.
41
42 B. As-built Drawings: Provide 2 complete sets of as-built reflected ceiling plans showing the
43 location and wiring configuration of all motion sensors and control units.
44
45 C. Warranty: Provide 2 copies of warrantees.
46

1 D. Training Documentation: Provide letter in final documents documenting that the Owner
2 (give name of person, date, duration, and content of training) received training required
3 in this section.
4

5 E. Factory Check out Documentation: Provide documentation of manufacturer's final
6 testing, adjusting, and commissioning of the completed installation.
7

8 1.6 REGULATORY REQUIREMENTS 9

10 A. UL Label: All lighting control system products shall be UL-labeled, individually and as a
11 system, for the specific applications utilized on this project.
12

13 1.7 WARRANTY 14

15 A. Special Warranty: Provide a five year parts and one year labor warranty on both wall and
16 ceiling motion sensor lighting controls. Warranty coverage shall begin at the time of
17 Project Substantial Completion.
18

19 1.8 OWNER'S INSTRUCTIONS 20

21 A. The contractor shall require the manufacturer to provide instruction to the owner's
22 personnel in the operation, adjustment, and maintenance of the system. The manufacturer
23 shall provide documentation of such training in the closeout submittals.
24

25 1.9 COMMISSIONING 26

27 A. Prior to substantial completion of the project, the contractor shall require the
28 manufacturer to test the operation of the system to ensure the proper operation of the
29 system throughout the range of building operating conditions. The manufacturer shall
30 provide documentation of such commissioning in the closeout submittals.
31
32

33 PART 2 PRODUCTS 34

35 2.1 MANUFACTURERS 36

37 A. If they comply with these specifications, products of the following, and only the
38 following, manufacturers will be acceptable. Other brand name product lines that use the
39 following as the original equipment manufacturer (OEM) will be allowed provided the
40 submittal clearly indicates the OEM.

- 41 1. Leviton
- 42 2. Watt Stopper
- 43 3. Square D
- 44 4. Hubbell
- 45 5. Sensorswitch
- 46 6. Lutron
- 47 7. Douglas Lighting Controls

1 2.2 MANUFACTURED UNITS

- 2
- 3 A. Occupancy Sensors – General Requirements: The following criteria apply to all sensors.
- 4 1. Ceiling mounted occupancy sensors shall be designed to turn room lighting "on"
- 5 immediately upon sensing a room occupant, unless specified or noted otherwise, and
- 6 to turn room lighting "off" if no room occupant is sensed for the entire period of
- 7 the sensors off time delay, regardless of the shape of the room. Wall switch
- 8 occupancy sensors shall have the same functions as ceiling mounted occupancy
- 9 sensors, except that lighting turn-on may be automatic or manual.
- 10 2. Sensors shall have built-in timing and load control-driving circuitry.
- 11 3. All sensors shall have user-adjustable controls for adjusting sensitivity of a sensor to
- 12 its controlled area, and for adjusting "time to light off" delay. Time delay shall be
- 13 made settable down to 5 minutes. Sensors must also include a time delay adjustment
- 14 of one minute or less for sensor operation testing. Adjustment controls shall be
- 15 recessed in order to limit tampering.
- 16 4. An internal bypass "manual-on" switch shall be provided for each sensor for use in
- 17 the event of sensor failure. When the bypass switch is activated, lighting shall remain
- 18 constantly "on" and on/off control shall divert to wall switches until sensor is
- 19 replaced. Override shall be accomplished without the use of unit specific or special
- 20 tools. The bypass control shall also be recessed to limit tampering.
- 21 5. Sensors shall be able to be wired in parallel to allow coverage of large areas.
- 22 6. All sensors shall be manufactured by the same company and shall be aesthetically
- 23 compatible; i.e., from the same product line or family of products. All sensors shall
- 24 be from the latest release generation. Do not mix old outdated product and new.
- 25 7. Sensors shall be compatible with specified ballasts in all luminaires.
- 26 8. All wall switch sensors shall be equipped with a user accessible push-button or
- 27 switch to turn "on" the lights and turn "off" the lights. With the switch in the "on"
- 28 position, sensors shall automatically turn the lights off if there is no movement
- 29 within the preset time delay interval, yet lights should remain "on" if movement is
- 30 detected. With the switch in the "off" position, the lights shall remain off regardless
- 31 of whether motion is detected.
- 32 9. All ceiling sensors shall be approved for installation in plenum ceiling spaces.
- 33 10. All ceiling sensors shall work in conjunction with wall switches as shown on the
- 34 plans and control one or more switched circuits as required.
- 35
- 36 B. Vacancy Sensors – General Requirements: The following criteria apply to all sensors.
- 37 1. Vacancy sensors must meet all of the criteria listed above for occupancy sensors.
- 38 Except for Part 2.2(A)(1) and Part 2.2(A)(8).
- 39 2. Where vacancy sensors are required, the manufactured units shall function per the
- 40 definition of a vacancy sensor listed under Definitions.
- 41 3. Ceiling mounted vacancy sensors shall be designed to wait for a signal from the
- 42 switch being turned "on", unless specified or noted otherwise, and to turn room
- 43 lighting "off" if no room occupant is sensed for the entire period of the sensors off
- 44 time delay, regardless of the shape of the room. Wall switch vacancy sensors shall
- 45 have the same functions as ceiling mounted vacancy sensors.

1 4. All wall switch sensors shall be equipped with a user accessible push-button or
2 switch to turn "on" the lights and turn "off" the lights. The switch shall be the only
3 device to turn the lights on. With the switch in the "off" position, the lights shall
4 remain off regardless of whether motion is detected.
5

6 C. Infrared Motion Sensors: In addition to the general criteria above, the following criteria
7 apply to passive infrared motion sensors, regardless of location or mounting type.

8 1. The passive infrared detector shall utilize a temperature compensated dual element
9 sensor and a multi-element fresnel lens.

10 2. Infrared sensors shall have a daylight filter that ensures the sensor is insensitive to
11 short wavelength infrared waves such as those emitted by the sun.
12

13 D. Ultrasonic Motion Sensors: In addition to the general criteria above, the following criteria
14 apply to ultrasonic motion sensors, regardless of location or mounting type.

15 1. Ultrasonic sensors shall provide volumetric coverage without gaps in coverage with
16 the controlled area.

17 2. Sensor operating frequency shall not interfere with other sensors in other areas.
18

19 E. Microphonic Motion Sensors: In addition to the general criteria above, the following
20 criteria apply to sensors using microphonic technology, regardless of location or
21 mounting type.

22 1. Microphonic technology shall be able to detect 2kHz to 20kHz.
23

24 F. Power Packs (Control/Switching Units): Power pack shall be an integrated self-contained
25 unit consisting internally of a load switching control relay and a transformer to provide
26 low-voltage power to sensors. Power pack shall meet UL 2043. Power pack relays and
27 features shall be as follows:

28 1. Relay contacts shall have ratings of:

29 a. at least 20A - 120 volts ac incandescent.

30 b. at least 20A - 120 volts ac ballast.

31 c. at least 20A - 277 volts ac ballast.

32 d. at least 1 HP at 120-250 VAC, 60 Hz
33

34 2. Relay contacts shall be isolated.

35 3. All controls shall be solid state design and be designed and manufactured specifically
36 for control of lighting for energy conservation.

37 4. Power packs shall integrate with other power packs, multiple motion sensors, photo
38 sensors and vacancy sensor system switches.

39 G. Wiring: Wiring between sensors and control units shall be three conductor (18 AWG
40 stranded) or CAT5/5e/6. Wiring shall be plenum rated in plenum spaces and UL
41 classified.
42
43

1 PART 3 EXECUTION

2
3 3.1 EXAMINATION

4
5 3.1.1 SITE VERIFICATION OF CONDITIONS

- 6
7 A. If the work is to be performed in an existing facility, visit the site of the proposed work
8 and observe its conditions so that you may be fully informed as to the materials, labor,
9 workmanship and conditions under which the work is to be done.
10
11 B. No allowances shall be made on account of any errors, negligence or failure to be aware
12 of the condition of the existing site.
13

14 3.2 INSTALLATION

- 15
16 A. General: Install motion sensor lighting controls as required and where indicated, in
17 accordance with manufacturer's written instructions and project shop drawings,
18 applicable requirements of NEC, and recognized industry practices to ensure that
19 products serve intended function.
20
21 B. Shop Drawing Preparation: Provide a set of floor plan drawings, showing furniture layout,
22 to the manufacturer for the purpose of creating shop drawings. Coordinate with the
23 manufacturer to determine the required medium (hard copy or electronic) and the format
24 required by the manufacturer.
25
26 C. Sensor Type Selection: Select the appropriate type of sensor for each room, subject to the
27 following constraint.
28
29 D. Sensor Design and Layout:
30 1. Provide the quantity of sensors required for complete and proper coverage without
31 gaps within the range of coverage of controlled areas. Rooms shall have 100%
32 coverage to completely cover the controlled area to accommodate all occupancy
33 habits of single or multiple occupants at any location within the room. The locations
34 and quantities of sensors shown on the Drawings are diagrammatic and indicate only
35 rooms that are to be provided with sensors. Provide additional sensors if required
36 to properly and completely cover the respective room. Proper judgment must be
37 exercised in executing the work so as to ensure the best possible installation in the
38 available space and to overcome local difficulties due to space limitations or
39 interference of structural components.
40 2. Exact locations of control unit hardware boxes shall be based on observing good
41 installation practice and shall be coordinated with other elements of the reflected
42 ceiling plan. Control unit hardware shall be fully concealed.
43
44 E. Box Condition: Install low voltage lighting control devices only in electrical boxes that
45 are clean, free from excess building material, debris, and similar matter.
46

1 F. Wiring:

- 2 1. All branch circuit wiring shall be installed in an approved raceway.
3 2. Low voltage wiring shall be installed in an approved raceway where concealed in
4 inaccessible locations or exposed. Where low voltage wiring is concealed in
5 accessible ceiling plenums, it may, at the Contractor's option, be routed without a
6 raceway using air plenum rated multi-conductor cable. All control wiring shall be
7 minimum 18 gauge stranded copper.
8 3. All low voltage wiring shall be color coded and identified or tagged at terminals to
9 assist with future maintenance.

10
11 G. Sensor Testing and Adjustment: At the time each sensor is installed, it shall be adjusted
12 as follows:

- 13 1. Sensitivity shall be adjusted for proper occupant detection appropriate to the usage
14 of the room.
15 2. Set time delay per specifications after setting in a 30 second test to verify
16 sensor/control unit operation.
17 3. Check indicator light of each sensor to verify that occupancy is being detected in the
18 range desired.
19 4. Sensor operating frequencies shall be selected to prevent interference with other
20 units in the vicinity as required.
21 5. Ensure that there are no obstructions which could block proper sensor coverage,
22 thereby minimizing the sensor detection zone.
23

24 H. Bypass Switches: Install line voltage bypass switches in room line voltage wiring for all
25 rooms with ceiling mounted sensors and control/switching units. Switches shall be series
26 wired with control/switching units to provide positive off control and function as
27 standard on/off switches if the motion sensor fails and is bypassed.
28

29 3.3 ADJUSTING

- 30
31 A. Motion sensors may be affected by various conditions in the room. It may be necessary
32 for the Contractor to make adjustments, change the location or type of sensor to obtain
33 proper operation in a specific room. The Contractor/equipment manufacturer shall have
34 final responsibility for proper operation and coverage of the system in each room and
35 should therefore make labor allowance for such changes and adjustments. The Contractor
36 is also responsible for acquiring approval from Engineer for any changes or deviations
37 from project specifications.
38

39 3.4 DEMONSTRATION

- 40
41 A. Upon completion of testing and adjustment, demonstrate operation of the system to
42 representatives of the Owner.
43
44 B. Instruct the Owner's personnel in proper maintenance, adjustment, and operation of the
45 motion sensor lighting controls.
46
47

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. AC Switches
- B. Receptacles
- C. Connectors
- D. Finish plates
- E. Relays

1.3 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables
- C. Section 26 05 33.13 - Boxes and Fittings for Electrical Systems

1.4 REFERENCES

- A. ANSI/UL 20 - General - Use Snap Switches
- B. ANSI/UL 498 - Electrical Attachment Plugs and Receptacles
- C. UL 943 – 2006 – Ground Fault Circuit Interrupters
- D. NEMA WD 1 - General - Purpose Wiring Devices
- E. Applicable Federal Specifications - WC - 596-F, WS-896E
- F. Mounting heights per Americans with Disabilities Act

1 1.5 SUBMITTALS

- 2
- 3 A. Submittals required in this section shall conform to and be submitted in accordance with
- 4 the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.
- 5
- 6 B. Product Data: Clearly mark product data for each product specified and/or proposed for
- 7 use. Product data shall include, but not limited to the following:
- 8 1. receptacle devices
- 9 2. switch devices
- 10 3. isolated ground receptacle devices
- 11 4. weatherproof receptacles
- 12 5. device plates
- 13 6. enclosures
- 14 7. keys
- 15

16 1.6 DESCRIPTION OF WORK

- 17
- 18 A. Provide factory fabricated wiring devices of the type and electrical rating for the service
- 19 indicated, provide proper selection to fulfill the wiring requirements. Wiring devices,
- 20 including receptacles and switches shall be colored to match wall plates. Special purpose
- 21 outlets shall be of appropriate color.
- 22
- 23 B. Provide a compatible receptacle for the cap or plug and cord of all other equipment
- 24 installed in this project.
- 25
- 26 C. Relays, if any, shall be multipole, mechanically held, 30 amperes 120V operating coil, 600V
- 27 contacts, auxiliary contacts as required for two wire operation, coil clearing contacts;
- 28 Zenith ESS Series or equal.
- 29
- 30 D. Provide switch, receptacle, outlet, conduit, and special purpose wall plates for wiring
- 31 devices, with ganging and cutouts as indicated, provided with metal screws for securing
- 32 plates to devices, screw heads colored to match finish of plate.
- 33
- 34 E. Provide oversize plates where required to completely cover wall opening. Where oversize
- 35 plates are used, all plates in room shall be oversize style.
- 36
- 37 F. Use plates and Raco narrow gang boxes in storefront mullions and where narrow boxes
- 38 are required.
- 39
- 40 G. Mount all switches, thermostats, etc. at the same height when located horizontally within
- 41 6 feet on same wall. See mechanical drawings for thermostat locations.
- 42
- 43

1 PART 2 PRODUCTS

2
3 2.1 AC SWITCHES

- 4
5 A. Quiet-type, commercial, specification grade, back and side-wired with grounding
6 terminals. Furnish AC switches which comply with NEMA WD-1 Standards, UL20 and
7 Federal Specification WC896. Special purpose switches shall be of appropriate color.
8 Switches shall be rated for 120-277 volt AC, number of poles as required.
9
10 B. Provide 120/277 volt NEMA 5-20 self-grounding specification grade devices only.
11
12 C. Provide 20 ampere ratings for all loads. Rated amperage capacity shall be 100% for all
13 lighting loads, and 80% for all motor loads.
14
15 D. Single Pole:
16 1. Leviton 1221-S
17 2. Hubbell CS1221
18 3. P&S CSB20AC1
19
20 E. Double Pole:
21 1. Leviton 1222-S
22 2. Hubbell CS1222
23 3. P&S CSB20AC2
24
25 F. Three Way:
26 1. Leviton 1223-S
27 2. Hubbell CS1223
28 3. P&S CSB20AC3
29
30 G. Four Way:
31 1. Leviton 1224-S
32 2. Hubbell CS1224
33 3. P&S CSB20AC4
34
35 H. Keyed switches:
36 1. Two-prong keys only. Single-prong keys will not be acceptable.
37 2. Provide 25 extra keys
38 3. Lock Single Pole: Leviton 1221-L (P&S 20AC1L)
39 4. Lock Double Pole: Leviton 1222-L (P&S 20AC2L)
40 5. Lock Three Way: Leviton 1223-L (P&S 20AC3L)
41 6. Lock Four Way: Leviton 1224-L (P&S 20AC4L)
42
43 I. Special Purpose Switches:
44 1. Quiet-type, industrial specification grade, 120-600 volt AC, number of poles as
45 required.
46 2. Security Keyed Switch: Leviton 1221-KL; P&S PS20AC1L
47 3. 20A. 2P Motor: 20AC2-HP (6806U-DAC); P&S PS20AC2HP

- 4. 30A. 2P Motor: 30AC2-HP (6808U-DAC); P&S PS30AC2HP
- 5. 30A. 3P Motor: 7803 (7810-UO); P&S 7803MD

J. Wall timer Switches:

- 1. Watt Stopper TS-400 with optional flash warning
- 2. Equals by P&S RT24 series.
- 3. Paragon will not be accepted.

2.2 RECEPTACLES

- A. Furnish receptacles which comply to NEMA WD-1 Standards, UL 498 and Federal Specification WC596F.
- B. 125 volt Nema 5-20R duplex, side wired, self-grounding with ground lug, specification grade hard use
- C. 20A. Duplex: Leviton 5362-S; P&S 5362
- D. GFCI Receptacles: 20-amp, duplex. Comply with NEMA WD 1, NEMA WD 6, UL 498, Federal Specification W-C-596, and UL943, Class A. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:
 - 1. Pass & Seymour; 2097, 2097 (NAFTA Compliant), PT2097 (use with PTR6STRNA prewired pigtail connector), PT2097NA (NAFTA Compliant - use with PTR6STRNA prewired pigtail connector).
 - 2. Equivalent by Leviton
 - 3. Equivalent by Hubbell
- E. Weatherproof Outlets:
 - 1. Provide GFCI receptacle as specified above.
 - 2. Receptacle covers protected from rain shall be zinc die-cast weather-resistant cover with self-closing lid, Leviton 4992, P&S WIUCAST1, or equivalent.
 - 3. Receptacle covers not protected from rain shall be "While-In-Use" cover, Leviton 5977DGY, P&S WIUC10DGL, or equivalent.
 - 4. Do not use feed through feature for any GFCI receptacle.
 - 5. Install separate GFCI device at each location.

2.3 VOICE/DATA OUTLETS

- A. Refer to Division 27. Device and plates provided.

2.4 DEVICE PLATES

- A. In kitchens, gyms, gang toilets and mechanical rooms, use stainless steel device plates and covers.
- B. In other finished spaces use smooth nylon device plates and covers.

1 C. At exposed boxes in dry interior spaces use heavy cadmium-plated sheet steel. Plate edges
2 must be flush with edges of boxes.

3
4 D. Device plate manufacturer and device manufacturer shall be the same so colors will
5 match. Stainless steel plates will not match the device.
6

7 2.5 DEVICE COLOR

8
9 A. Device color to be white, except as otherwise indicated or required by code.
10

11 2.6 MANUFACTURERS

12
13 A. Products to be equivalent to the manufacturer, Pass & Seymour (P&S), and model
14 numbers listed in this section. Subject to compliance with requirements, provide products
15 by one of the following:

- 16 1. Arrow - Hart Div., Cooper Industries
- 17 2. Bryant
- 18 3. Hubbell Inc.
- 19 4. Leviton MFG. Co., Inc.
- 20 5. Pass & Seymour/Legrand

21
22 2.7 POWER/DATA RACEWAY DEVICES

23
24 A. Provide all telecommunications and data plates in power/data raceways as specified and
25 noted on Communications Drawings. Devices to be compatible with power/data
26 raceways as specified in Section 26 05 33.11.
27

28
29 PART 3 EXECUTION

30
31 3.1 INSTALLATION

32
33 A. Wall Switches:

- 34 1. Install in a suitable outlet box on the strike side of the door.
- 35 2. Mount at a height of 44" from the finished floor to the bottom of the switch.
- 36 3. Position switches in a uniform position so that the same direction of operation will
37 open and close the circuits throughout the job. Position up or to the left for the ON
38 position.
- 39 4. Do not install behind markerboards, millwork, permanent mounted equipment, etc.
40 Verify on drawings before installation. Where installed in unsuitable location, the
41 Contractor will move as directed at no cost to Owner.
- 42 5. Prewired pigtail connectors that accommodate UL Fed Spec receptacles are approved
43 for installation. P&S PlugTail or equal.
44

45 B. Receptacles:

- 46 1. Install in a suitable steel outlet box.

- 1 2. Mount vertically at a height of 18 inches from the finished floor to the bottom of the
- 2 receptacle or as shown on the drawings.
- 3 3. Provide tamper resistant receptacles in classrooms for third grade and below.
- 4 Receptacles mounted higher than 5½ feet above the floor are exempt from this
- 5 requirement.
- 6 4. The Architect can move any receptacle, before installation, up to 6 feet in any
- 7 direction at no additional cost.
- 8 5. Do not install behind markerboards, millwork, permanent mounted equipment, etc.
- 9 Verify on Architectural drawings before installation. Where installed in unsuitable
- 10 location, the Contractor will move as directed at no cost to Owner.
- 11 6. Prewired pigtail connectors that accommodate UL Fed Spec receptacles are approved
- 12 for installation. P&S PlugTail or equal.
- 13
- 14 C. Device plates:
- 15 1. Install device plates for each outlet box of the type required for service.
- 16 2. Use a single one-piece device plate for ganged devices (switches & receptacle).
- 17 3. Use separate device plates for dimmers, volume controls and electronic devices.
- 18
- 19 D. Poke-Thru Devices:
- 20 1. Provide and install all wiring, devices, covers, plates, conduit and hardware as required
- 21 for a complete installation. Do not daisy-chain poke-thru devices with conduits unless
- 22 otherwise noted on drawings.
- 23 2. Wiremold Evolution 8AT. Provide and install three duplex outlets and associated
- 24 wiring per general notes on drawings. Provide isolated-ground outlets if indicated by
- 25 symbol on drawings. Provide power to outlet using circuits shown on plans.
- 26
- 27

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 GENERAL

1.1 SUMMARY

- A. This section supplements section 26 00 00 Electrical and contains additional requirements applicable to fuses.

1.2 SECTION INCLUDES

- A. Low voltage fuses rated below 600 volts and 2000 amperes.

1.3 RELATED SECTIONS

- A. Section 26 00 00 – Electrical
- B. Section 26 00 90 - Electrical Submittal Procedures

1.4 SUBMITTALS

- A. Submit product data for fuses in accordance with Section 26 00 90 Electrical Submittal Procedures.

1.5 QUALITY ASSURANCE

- A. Prior to ordering fuses or fuse holders, coordinate fuse ratings with the mechanical contractor to verify that fuses for HVAC equipment matches the MOCP values of the HVAC equipment being provided.

1.6 EXTRA MATERIALS

- A. Spare fuses: For each size and type fuse installed, provide to the owner at substantial completion six each or 10% of the quantity used on the project, whichever is less.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. All fuses shall be from a single manufacturer. Products of the following manufacturers are acceptable.
 1. Bussman
 2. Littlefuse

SECTION 26 28 16

ENCLOSED SAFETY SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 SECTION INCLUDES

- A. Safety switches
- B. Disconnect Switches

1.1.2 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 00 90 - Electrical Submittal Procedures
- C. Section 26 28 13 - Fuses

1.2 REFERENCES

- A. ANSI/UL 98 - Safety Standard for Enclosed Switches.
- B. NEMA KS 1 - Enclosed Switches.

1.3 SYSTEM DESCRIPTION

- A. Safety switches shall be of the same manufacturer as distribution switchgear.
- B. The extent of safety switches, disconnect switches is indicated on the drawings and by the requirements of this section.
- C. In accordance with the service indicated, use 240 or 600 volt switches, single throw, fusible, or non-fusible, horsepower rated, 100% load break and make rated, designed for locking in "ON" or "OFF" position, in code gauge steel cabinets, as required by the application and the N.E.C.
- D. Use switches which have number of poles required, dependent on equipment requirements.
- E. Use NEMA 3R switches where exposed to weather, with weatherproof threaded hubs for top or side conduit entries into switch.

- 1 F. Use fuse clips which are rejecting type to accept Class RK or L fuses only.
2
3 G. Size fuses serving motor loads at 125% to 175% of motor nameplate rating, or the next
4 standard size and as specifically recommended by motor or equipment manufacturer.
5
6 H. Provide a manual switch at each motor, class 2510 Square D, for motors shown with
7 "MS." Provide a 20-AMP rated switch at each motor not otherwise noted.
8

9 1.4 SUBMITTALS

- 10
11 A. Submittals required in this section shall conform to and be submitted in accordance with
12 the General Conditions, Division 1 and Division 26, Section 26 00 90 requirements.
13

14 1.5 PRODUCT DATA

- 15
16 A. Submit product data for the following.
17 1. Safety and Disconnect Switches
18
19

20 PART 2 PRODUCTS

21
22 2.1 MANUFACTURERS

- 23
24 A. General Electric
25
26 B. Square D
27
28 C. Siemens
29
30 D. Cutler-Hammer
31
32 E. Challenger
33

34 2.2 SWITCHES

- 35
36 A. Provide safety switches and disconnects with a voltage rating suitable for the nominal
37 voltage of the system in which they are to be applied. Contacts are quick-make,
38 quick-break.
39
40 B. Provide a Lightning Surge Arrestor on all outdoor rooftop HVAC units and on all
41 condensing unit switches. Mount to bottom of switch or as recommended by the
42 manufacturer. Provide a Square D SDSA 3650 Series. Equals by General Electric, Joslyn,
43 or approved equal.
44

45 2.3 CONSTRUCTION

- 46
47 A. Indoor dry locations, 30 amp thru 100 amp, use NEMA 1 general duty (GD).

- 1 B. All outdoor locations use NEMA 3R heavy duty (HD).
2
3 C. The handle shall be suitable for padlocking in the OFF position. Defeatable, front
4 accessible, coin-proof door interlock to prevent opening the door when the switch is in
5 the ON position and to prevent turning the switch ON when the door is open. Incoming
6 line terminals with an insulated shield.
7
8 D. Provide switches with rejection-type fuse holders suitable for use with fuses specified
9 under Section 26 28 13.

10
11
12 PART 3 EXECUTION

13
14 3.1 INSTALLATION

- 15
16 A. Mount switches no more than 6 inches above and within 6 feet of the equipment served
17 at the direction of the Engineer, so that operating handle is easily accessible. Align tops
18 of switches when grouped together.
19
20 B. Mount vertically on required separate support system hardware with switch easily
21 accessible (door to open 90 degrees minimum).
22
23 C. Permanently mount safety switches from inside with plated or stainless bolts, toggle bolts
24 or anchors.
25
26 D. Exposed mounting bolts, screws, etc. are not acceptable.
27
28 E. Permanently install fusible switches with class R fuse kits so that fuses are readable when
29 looking at open switch.
30
31 F. Do not mount switches/disconnects to access panels or on nameplate data or equipment.
32
33 G. Installation of Conductors: Switches shall not be used as “junction boxes” between
34 HVAC units (splicing or “pig tailing” is not permitted). The maximum number of
35 conductors allowed per termination is determined by the manufacturer’s approved rating
36 for each terminal or lug. Multiple conductor configurations shall be highlighted in the
37 contractor’s submittal package. Exceptions to this rating must be obtained in writing from
38 the engineer’s office on a case by case basis.
39
40 H. Coordinate and verify exact fuse sizes with mechanical contractor. Fuses shown on
41 drawings are based on one manufacturer. Fuse sizes vary depending on manufacturer.
42
43

END OF SECTION

SECTION 26 50 00

LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section supplements section 26 00 00 - Electrical and contains additional requirements applicable to all lighting systems.

1.2 SECTION INCLUDES

- A. Interior and exterior lighting systems, with the exception of sports lighting and theatrical lighting.
- B. Luminaires, lamps, ballasts, LED drivers, emergency battery packs, emergency power transfer devices.

1.3 RELATED SECTIONS

- A. Section 26 00 00 – Electrical
- B. Section 26 00 90 - Electrical Submittal Procedures
- C. Section 26 09 23.13 – Motion Sensor Lighting Controls

1.4 REFERENCES

- A. Energy Star
- B. DLC - DesignLights™ Consortium
- C. TCLP - Federal Toxicity Characteristic Leaching Procedure
- D. UL 1598 - Safety Standard for Luminaires
- E. ANSI/UL 844 - Safety Standard for Electric Lighting Fixture for Use in Hazardous Locations
- F. ANSI C78.377 - Specification for the Chromaticity of Solid State Lighting Products
- G. ANSI/UL 1029 - Safety Standard for High Intensity Discharge Lamp Ballasts
- H. NECA/IESNA 500 (2006) - Recommended Practice for Installing Indoor Commercial Lighting Systems

- 1
2 I. NECA/IESNA 501 (2006) - Recommended Practice for Installing Exterior Lighting
3 Systems
4
5 J. UL 8750 - Safety Standard for LED Equipment for Use in Lighting Products
6
7 K. UL 924 - Standard for Emergency Lighting and Power Equipment
8
9 L. UL 935 - Safety Standard for Fluorescent-Lamp Ballasts
10
11 M. LM-79 - Approved Method: Electrical and Photometric Measurements of Solid State
12 Lighting Products
13
14 N. LM-80 - Approved Method: Measuring Lumen Maintenance of LED Light Sources
15
16 O. TM-21 - Projecting Long Term Lumen Maintenance of LED Light Sources
17

18 1.5 PERFORMANCE REQUIREMENTS
19

- 20 A. All lighting systems shall be compatible with lighting controls shown on the drawings or
21 specified in 26 09 23.13 - Motion Sensor Lighting Controls.
22

23 1.6 SUBMITTALS
24

- 25 A. Submit in accordance with Section 26 00 90 - Electrical Submittal Procedures.
26

27 1.7 PRODUCT DATA
28

- 29 A. Submit complete product information for the following:

- 30 1. Luminaires
31 2. Lamps
32 3. Ballasts
33 4. LED drivers
34 5. Battery backup units
35 6. Automatic transfer devices for emergency lighting
36 7. Product warranty documentation
37

- 38 B. Submit luminaires shown on the Luminaire Schedule on the drawings and those noted
39 on the drawings but not on the schedule.
40

- 41 C. Include complete manufacturer's part numbers.
42

- 43 D. Clearly highlight or otherwise indicate on the cut sheets all options and accessories.
44

- 45 E. Indicate if [DLC](#) listing applies only to certain color temperatures, beam spreads, or other
46 luminaire options. Indicate if any luminaire options void the DLC listing.
47

1 F. Indicate the L70 rating and the number of LM-80 testing hours for all LED luminaires.

2
3 1.8 SAMPLES

4
5 A. Submit non-returnable samples of fixtures upon request. Include all lamps and ballasts.

6
7 1.9 CLOSEOUT SUBMITTALS

8
9 A. Provide owner a list of all luminaire types used on the project using manufacturer part
10 numbers.

11
12 B. Provide owner a list of all ballast types and lamp types used on the project using ANSI
13 and manufacturer codes.

14
15 C. Provide owner a list of battery backup, automatic transfer devices, etc. on the project
16 using manufacturer part numbers. Provide on as-built drawings the location of all
17 remote-mounted battery backups.

18
19 1.10 QUALIFICATIONS

20
21 A. All luminaires shall be from manufacturers who has been regularly engaged in the
22 production of such products for the past five years.

23
24 1.11 REGULATORY REQUIREMENTS

25
26 A. All luminaires and components, including lamps, ballasts, emergency battery packs,
27 transfer devices, LED modules and drivers shall be UL listed.

28
29 1.12 STORAGE AND PROTECTION

30
31 A. Store all product in accordance with manufacturer's storage requirements.

32
33 1.13 SPECIAL WARRANTY

34
35 A. Provide a 1 year warranty from date of project substantial completion for all fluorescent
36 and HID luminaires.

37
38 B. Provide a 5 year warranty from date of project substantial completion for all LED
39 luminaires. The warranty shall include all luminaire components including, but not limited
40 to, LED arrays, LED drivers, luminaire body and hardware. LED arrays will be
41 considered defective if a total of 15% or more of the individual light emitting diodes fail
42 to illuminate.

43
44 C. Provide a 1 year warranty from date of installation for all lamps.

45
46 D. Provide a nominal 5 year (25,000 burn hours over 60 months) warranty from date of
47 installation for all ballasts.

1 E. The warranties shall cover the cost of materials and labor for repair and installation.
2
3

4 PART 2 PRODUCTS
5

6 2.1 MANUFACTURERS
7

8 A. Only those manufacturers of luminaires, lamps, and ballasts listed on the Luminaire
9 Schedule or listed in the specifications are acceptable.
10

11 B. Provide lamps from one manufacturer, unless otherwise required.
12

13 C. Provide ballasts from one manufacturer, unless otherwise required.
14

15 D. Accepted ballast manufacturers:

- 16 1. Osram Sylvania
 - 17 2. General Electric
 - 18 3. Philips Advance
 - 19 4. Universal
- 20

21 E. Accepted lamp manufacturers:

- 22 1. Osram Sylvania
 - 23 2. General Electric
 - 24 3. Philips
- 25

26 2.2 EXISTING PRODUCTS
27

28 A. New luminaires must match existing luminaires in all areas including but not limited to
29 style, color, orientation, mounting height, ballast and lamp type, switching capability,
30 voltage, etc. The new luminaires must meet or exceed the quality of the existing luminaires
31 and must meet all current codes and standards for efficiency.
32

33 B. New lamps and ballasts must match existing lamps and ballasts regarding manufacturer
34 and operation. The new lamps and ballasts must meet or exceed the quality of the existing
35 lamps and ballasts, and must meet all current codes and standards for efficiency.
36

37 2.3 LUMINAIRES
38

39 A. The following requirements apply to all luminaires. See following articles for additional
40 requirements for specific types of luminaires.
41

42 B. Only those products listed on the Luminaire Schedule or noted in the drawings are
43 acceptable.
44

45 C. Unless otherwise noted, consult architect for luminaire color or finish.
46

- 1 D. All fluorescent and HID luminaires shall comply with UL 1598 requirements and be UL
2 listed.
3
4 E. All luminaires used in hazardous locations shall comply with UL 844 requirements and
5 be UL listed.
6
7 F. All luminaires used for emergency lighting, including exit lights, shall be UL 924 listed.
8

9 2.4 LED LUMINAIRES

- 10
11 A. LED luminaires shall meet the following requirements in addition to the general
12 requirements for luminaires listed above.
13
14 B. All LED luminaires shall comply with UL 8750 requirements and be UL listed.
15
16 C. All LED luminaires shall be either Energy Star or DLC approved.
17
18 D. Expected Life: All LED luminaires shall have a minimum L70 of 50,000 hours. The
19 estimated L70 of LED luminaires shall be derived from LM-80 test data in accordance
20 with [TM-21](#) procedures. LM-80 test data shall be measured in accordance with LM-79
21 procedures.
22
23 E. Color rendering: All LED luminaires shall have a minimum CRI of 82.
24
25 F. Color temperature: Unless specified to the contrary, all LED luminaires on the same
26 project are to have the same correlated color temperature (CCT). See the Luminaire
27 Schedule for LED CCT. LED luminaire CCT shall be within a 3-step SCDM (Standard
28 Deviation Color Matching) in accordance with ANSI C78.377.
29
30 G. Maximum power: The maximum power input of all LED luminaires shall be as indicated
31 on the Luminaire Schedule, with a tolerance of +5% / -10%.
32
33 H. Efficacy: All LED luminaires shall have a minimum efficacy of 90 lumens/watt.
34
35 I. Lumen output: The lumen output of all LED luminaires shall be as indicated on the
36 Luminaire Schedule, with a tolerance of plus or minus 8%.
37

38 2.5 TROFFER AND STRIP LUMINAIRES

- 39
40 A. Fluorescent troffer and strip luminaires shall meet the following requirements in addition
41 to the general requirements for luminaires listed above. LED troffer and strip luminaires
42 shall meet the following requirements in addition to the requirements for LED luminaires
43 listed above.
44
45 B. Troffers to have integral T-bar safety clips.
46

- 1 C. Troffers to have steel door with spring cam latches.
- 2
- 3 D. Fluorescent luminaires must be designed to work specifically with T8, T5 or T5HO
- 4 lamps.
- 5
- 6 E. Troffers shall have a .125" thick acrylic lens (UV Stabilized) unless otherwise indicated in
- 7 the Luminaire Schedule.
- 8
- 9 F. All 2X4 fluorescent lensed troffers must have efficiency of 80% or better.
- 10
- 11 G. All 2X2 fluorescent lensed troffers must have efficiency of 70% or better.
- 12
- 13 H. All 4X4 fluorescent lensed troffers must have efficiency of 70% or better.
- 14

15 2.6 RECESSED CAN LUMINAIRES

- 16
- 17 A. Recessed can luminaires shall meet the following requirements in addition to the general
- 18 requirements for luminaires listed above. LED recessed can luminaires shall meet the
- 19 following requirements in addition to the requirements for LED luminaires listed above.
- 20
- 21 B. Reflectors to be highly specular unless otherwise noted on the Luminaire Schedule.
- 22
- 23 C. Housing to have a galvanized steel frame.
- 24
- 25 D. Mounting assembly of fluorescent luminaires shall allow for both vertical and horizontal
- 26 adjustment.
- 27
- 28 E. Mounting assembly shall allow for at least 7/8" ceiling thickness.
- 29
- 30 F. Integral junction box shall be galvanized steel.
- 31
- 32 G. Downlights shall be UL listed for thru-branch wiring and damp locations.
- 33
- 34 H. All down lights used in shower areas shall have sealed gasketed drop lenses.
- 35

36 2.7 LINEAR PENDANT LUMINAIRES

- 37
- 38 A. Linear pendant luminaires shall meet the following requirements in addition to the general
- 39 requirements for luminaires listed above. LED linear pendant luminaires shall meet the
- 40 following requirements in addition to the requirements for LED luminaires listed above.
- 41
- 42 B. Provide with aircraft cable mount and all required hardware unless other mount type is
- 43 called out on the Luminaire Schedule.
- 44
- 45 C. Housing to be aluminum or formed steel.
- 46

1 D. All 8' and longer sections shall be able to accommodate dual ballasts or drivers and battery
2 backup for dual switching and emergency applications.
3

4 2.8 LOW BAY AND HIGH BAY HID LUMINAIRES
5

6 A. Low bay and High Bay HID luminaires shall meet the following requirements in addition
7 to the general requirements for luminaires listed above.
8

9 B. Housing and reflector of low bay and high bay HID luminaires shall be made of
10 borosilicate glass, UV-stabilized clear acrylic, or aluminum.
11

12 C. HID luminaires in gymnasium play areas shall have safety hooks and shall have twist lock
13 cord & plug connection. Safety hooks shall be provided with safety screws or other
14 positive mechanical means to prevent the hooks from being dislodged.
15

16 D. All HID luminaires located in gyms, play areas, multipurpose spaces, etc. shall have a lens
17 and wire guard.
18

19 E. Lens or wire guard for low bay and high bay HID luminaires shall be hinged and shall
20 have retainer latches for tool-less maintenance.
21

22 F. All low bay and high bay HID luminaires shall be enclosed or allow only type O lamps.
23

24 2.9 HIGH BAY FLUORESCENT AND LED LUMINAIRES
25

26 A. Fluorescent high bay luminaires shall meet the following requirements in addition to the
27 general requirements for luminaires listed above. LED high bay luminaires shall meet the
28 following requirements in addition to the requirements for LED luminaires listed above.
29

30 B. All high bay luminaires located in gyms, play areas, multipurpose spaces, etc. shall have a
31 wire guard.
32

33 C. Lens or wire guard of high bay luminaires shall be hinged and shall have retainer latches
34 for tool-less maintenance.
35

36 2.10 WALL SCONCE LUMINAIRES
37

38 A. Wall sconce luminaires shall meet the following requirements in addition to the general
39 requirements for luminaires listed above. LED wall sconce luminaires shall meet the
40 following requirements in addition to the requirements for LED luminaires listed above.
41

42 B. Wall sconce housing shall be made of steel or cast aluminum.
43

44 C. Unless otherwise stated, luminaire shall mount directly to junction box.
45

1 2.11 EXIT SIGNS

- 2
- 3 A. LED exit signs shall also meet the following requirements in addition to the general
- 4 requirements for LED luminaires.
- 5
- 6 B. LED exit signs shall be rated for at least 10 years unless otherwise noted.
- 7
- 8 C. LED exit signs shall be provided with maintenance free nickel-cadmium batteries good
- 9 for at least 90 minutes.
- 10
- 11 D. LED exit signs shall be provided with status indicator lamp and test switch.
- 12
- 13 E. Powered LED exit signs shall be UL tested and approved with 100' visibility.
- 14
- 15 F. Non-LED self-luminous exit signs shall be good for at least 20 years and shall be UL
- 16 tested and approved with 100' visibility.
- 17
- 18 G. Exit signs in gyms shall have a wire guard.
- 19

20 2.12 POLE-MOUNTED EXTERIOR LUMINAIRES

- 21
- 22 A. Pole-mounted exterior luminaires shall meet the following requirements in addition to
- 23 the general requirements for luminaires listed above. LED pole-mounted luminaires shall
- 24 meet the following requirements in addition to the requirements for LED luminaires
- 25 listed above.
- 26
- 27 B. Lamp sockets of pole mounted HID luminaires shall be rated for at least 600w.
- 28
- 29 C. Pole mounted luminaires shall have an option for internal glare control or external glare
- 30 shield where applicable.
- 31
- 32 D. All exterior surfaces of pole mounted luminaires shall be painted using powder coat finish.
- 33

34 2.13 LAMPS

- 35
- 36 A. The following requirements apply to all lamps. See following articles for additional
- 37 requirements for specific types of lamps.
- 38
- 39 B. Ballast compatibility: Lamps shall match the ballast starting type.
- 40
- 41 C. All lamps shall pass the TCLP criteria for classification as non-hazardous waste.
- 42

43 2.14 FLUORESCENT LAMPS

- 44
- 45 A. Fluorescent lamps shall meet the following requirements in addition to the general
- 46 requirements for lamps listed above.
- 47

- 1 B. Unless specified to the contrary, all fluorescent and compact fluorescent lamps on the
2 same project are to have the same correlated color temperature (CCT). See the Luminaire
3 Schedule for lamp CCT.
4
5 C. All fluorescent lamps installed in open luminaires shall be coated or sleeved (from the
6 factory) if installed in a kitchen, concessions, or other areas around food.
7
8 D. Provide fluorescent lamps with a minimum CRI of 82.
9
10 E. Provide fluorescent lamps with a minimum lumen maintenance of 94%.
11
12 F. T8 fluorescent lamps shall have a minimum rated lamp life of 30,000 hours based on 12
13 hours of operation per start.
14
15 G. T5 and T5HO fluorescent lamps shall have a minimum rated lamp life of 36,000 hours
16 based on 12 hours of operation per start.
17
18 H. Provide compact fluorescent (CFL) lamps with 10mm tube diameter in wattages up to 26
19 watt and 15mm diameter in wattages from 38 watts to 50 watts.
20
21 I. CFL lamps shall have a minimum rated lamp life of 12,000 hours based on 12 hours of
22 operation per start.
23

24 2.15 INDUCTION LAMPS
25

- 26 A. Induction lamps shall meet the following requirements in addition to the requirements
27 for fluorescent lamps listed above.
28
29 B. Induction lamps shall have a minimum starting temperature of 50°F indoor and 0°F
30 outdoor.
31
32 C. Induction lamps shall have a minimum lamp life of 100,000 hours.
33

34 2.16 COLD CATHODE & NEON LAMPS
35

- 36 A. Cold cathode and neon lamps shall meet the following requirements in addition to the
37 general requirements for lamps listed above.
38
39 B. Cold cathode and neon lamps shall be provided and installed to operate with high
40 frequency electronic ballasts unless indicated otherwise on the Luminaire Schedule.
41
42 C. Cold cathode and neon lamps shall have a minimum starting temperature of 50°F indoor
43 and 0°F outdoor.
44

1 2.17 HID LAMPS

- 2
- 3 A. HID lamps shall meet the following requirements in addition to the general requirements
- 4 for lamps listed above.
- 5
- 6 B. Burning position: The burning position of HID lamps shall match luminaire orientation
- 7 and meet lamp manufacturer's specifications.
- 8 C. Unless specified to the contrary, all HID lamps on the same project are to have the same
- 9 correlated color temperature (CCT).
- 10
- 11 D. All HID lamps installed in open luminaires shall be protected lamps.
- 12
- 13 E. All HID lamps shall be clear unless otherwise noted.

14

15 2.18 METAL HALIDE LAMPS

- 16
- 17 A. Metal Halide lamps shall meet the following requirements in addition to the requirements
- 18 for HID lamps listed above.
- 19
- 20 B. Provide metal halide lamps with a minimum CRI of 65.
- 21
- 22 C. See Luminaire Schedule for lamp CCT. If it is not listed there, provide a CCT of 4100k.
- 23
- 24 D. Metal halide lamps shall meet the following criteria for minimum lamp life and minimum
- 25 initial lumens.
- 26

PART DESCRIPTION	PART NUMBER	LAMP LIFE (HRS)	MIN. INITIAL LUMENS
50w PS	MP50/U/MED	10k	1900
70w PS	MP70/U/MED	10k	3400
100w PS	MP100/U/MED	10k	5525
150w PS	MP150/U/MED	10k	8800
175w	MP175	10k	10200
175w PS	MS175/PS	15k	12800
200w PS	MS200/PS	15k	13300
250w	MP250	10k	17000
250w PS	MP250/PS	15k	17000
320w PS	MS320/PS	15K	21000
350w PS	MP350/PS	20K	24500
400w	MP400	15K	20500
400w SMH	MS400	20K	26000
400w PS	MS400/PS	20K	31000
750w PS	MS750/PS	12K	51000
1000w	M1000/U	12K	86300
1000w SMH	MS1000	18K	92000
1000w PS	M1000/PS	9K	86300
1500w	M1500	3K	127400

1
2 2.19 HIGH PRESSURE SODIUM (HPS) LAMPS
3

- 4 A. HPS lamps shall meet the following requirements in addition to the general requirements
5 for HID lamps listed above.
6
7 B. Provide HPS lamps with a minimum CRI of 82.
8
9 C. See Luminaire Schedule for lamp CCT. If it is not listed there, provide a CCT of 2100k.
10
11 D. Provide HPS lamps with a minimum Lumen Maintenance of 94%.
12
13 E. HPS lamps shall meet the following criteria for minimum lamp life and minimum initial
14 lumens.

PART DESCRIPTION	PART NUMBER	LAMP LIFE (HRS)	MIN. MEAN LUMENS
35w	LU35/MED	16K	2050
50w	LU50/MED	24K	3600
70w	LU70/MED	24K	5350
100w	LU100/MED	24K	8000
150w	LU150/MED	24K	12500
200w	LU200/ECO	24K	19800
250w	LU250/ECO	24K	26100
400w	LU400/ECO	24K	45000
750W	LU750	24K	94500
1000W	LU1000	24K	124000

15
16 2.20 BALLASTS
17

- 18 A. The following requirements apply to all ballasts. See following articles for additional
19 requirements for specific types of ballasts
20
21 B. Input power: Ballast input wattage for the supplied ballast must be the same or less than
22 the input wattage listed on the Luminaire Schedule.
23
24 C. Ballast factor: The ballast factor for the supplied ballast must be the same or greater than
25 the ballast factor of the ballast listed in the Luminaire Schedule.
26
27 D. Voltage: Ballasts shall be 60 Hz, universal input voltage (120V – 277V) +/- 10% unless
28 otherwise indicated in the Luminaire Schedule.
29
30 E. Remote ballasts: Remote ballasts shall have remote wiring capability of up to 20 feet.
31
32 F. Lamp compatibility: Ballasts shall provide lamp starting conditions and operating
33 parameters consistent with lamp manufacturer's recommendations and shall be suitable
34 for the luminaire operating conditions.
35

- 1 G. Wiring Diagrams: Ballasts shall have wiring diagrams and lamp connections displayed on
2 the ballast.
- 3
- 4 H. Sensor compatibility: Ballasts shall be compatible with and not cause interference with
5 the operation of occupancy sensors or other infrared control systems.
- 6
- 7 I. Sound rating: Ballasts shall have a Class "A" sound rating.
- 8
- 9 J. Ballasts shall be CBM-ETL certified, UL Class P, and bear such labels.

10
11 2.21 FLUORESCENT BALLASTS

- 12
- 13 A. Fluorescent ballasts shall meet the following requirements in addition to the general
14 requirements for ballasts listed above.
- 15
- 16 B. Fluorescent ballasts shall comply with UL 935 and be UL listed.
- 17
- 18 C. Fluorescent ballasts shall comply with FCC - 47CFR Part 18 Non-Consumer for
19 EMI/RFI interference.
- 20
- 21 D. Power factor: Fluorescent ballasts shall have a power factor of 0.97 or greater.
- 22
- 23 E. Total harmonic distortion (THD): Fluorescent ballasts shall be 10% THD or less.
- 24
- 25 F. Enclosure Temperature: Fluorescent ballasts shall have a maximum enclosure
26 temperature rating of 70°C.
- 27
- 28 G. High Frequency: Fluorescent ballasts shall be high frequency electronic type, operating at
29 a frequency between 42 kHz and 46 kHz.
- 30
- 31 H. Tandem wiring: Multiple luminaires shall not share a common ballast (no tandem wiring).

32
33 2.22 T8 BALLASTS

- 34
- 35 A. T8 ballasts shall meet the following requirements in addition to the requirements for
36 fluorescent ballasts listed above.
- 37
- 38 B. Ballast type: T8 ballasts shall be program rapid start type unless indicated otherwise on
39 the Luminaire Schedule.

40

C. Instant start ballasts shall be parallel circuit wired.

BALLAST DESCRIPTION	MIN. BALLAST FACTOR	MAX. BALLAST WATTAGE			
		1 LP	2 LP	3 LP	4 LP
I.S. HIGH EFFICIENCY	0.88	28	55	83	108
I.S. HIGH EFF. LOW POWER	0.78	25	48	71	95
PROGRAM R.S. (STANDARD)	0.88	31	59	88	118
PROGRAM R.S. LOW POWER	0.87	28	55	82	109
PROGRAM R.S. DIMMING	0.88	30	60	87	114

2.23 T5 & T5HO BALLASTS

- A. T5 and T5HO ballasts shall meet the following requirements in addition to the requirements for fluorescent ballasts listed above.
- B. Ballast type: T5 and T5HO ballasts shall be program rapid start type.
- C. End of life: Ballasts for T5 and smaller diameters shall have end of life (EOL) sensing in accordance with NEMA C78.81 and NEMA C78.901 as applicable.

BALLAST DESCRIPTION	MIN. BALLAST FACTOR	MAX. BALLAST WATTAGE	
		1 LP	2 LP
ALL T5	1.0	32	65
ALL T5HO	1.0	62	121

2.24 COMPACT FLUORESCENT BALLASTS

- A. CFL ballasts shall meet the following requirements in addition to the requirements for fluorescent ballasts listed above.
- B. Ballast type: Compact fluorescent ballasts shall be program rapid start type unless indicated otherwise on the Luminaire Schedule.
- C. Compact fluorescent ballasts for lamps thru 13 watt shall be encapsulated, full light output and pre-heat start.
- D. Compact fluorescent ballasts for lamps 18 watt thru 55 watt shall be 4 pin base, full light output. Equal to Advance "Standard", "Centium", "Mark V".

1

BALLAST DESCRIPTION	MIN. BALLAST FACTOR	MAX. BALLAST WATTAGE	
		1 LP	2 LP
13W CF	1.0	16	29
18W CF	1.0	20	38
26W DOUBLE TUBE CF	1.0	28	54
26W TRIPLE TUBE CF	1.0	28	54
32W TRIPLE TUBE CF	.98	35	69
42W TRIPLE TUBE CF	.95	45	94

2

3

2.25 INDUCTION BALLASTS

4

5

A. Induction lamp ballasts shall meet the following requirements in addition to the requirements for fluorescent ballasts listed above.

6

7

8

B. Induction lamp ballasts shall have a minimum ballast factor of 1.0.

9

10

2.26 COLD CATHODE & NEON BALLASTS

11

12

A. Cold cathode and neon ballasts shall meet the following requirements in addition to the general requirements for ballasts listed above.

13

14

15

B. Cold cathode end neon ballasts shall be high frequency electronic type unless indicated otherwise on the Luminaire Schedule.

16

17

18

C. Enclosure Temperature: Cold cathode and neon ballasts shall have a maximum enclosure temperature rating of 70°C.

19

20

21

2.27 HID BALLASTS

22

23

A. HID ballasts shall meet the following requirements in addition to the general requirements for ballasts listed above.

24

25

26

B. HID ballasts shall comply with UL 1029 and be UL listed.

27

28

C. Total harmonic distortion (THD): Magnetic HID ballasts shall be 33% THD or less and electronic HID ballasts shall be 15% THD or less.

29

30

31

D. Power factor: HID ballasts shall be high power factor of 90% or greater.

32

33

E. Operating temperature range: Outdoor HID ballasts shall be enclosed in a weatherproof housing and rated to operate to a temperature of minus 20°F.

34

35

1 2.28 MAGNETIC HID BALLASTS
2

BALLAST DESCRIPTION	MIN. BALLAST FACTOR	MAX. BALLAST WATTAGE
250W MH	1.0	290
400W MH	1.0	458
1000W MH	1.0	1080
1500W MH	1.0	1605

3
4 2.29 PULSE START MAGNETIC HID BALLASTS
5

BALLAST DESCRIPTION	MIN. BALLAST FACTOR	MAX. BALLAST WATTAGE
39W PMH	1.0	58
50W PMH	1.0	67
70W PMH	1.0	95
100W PMH	1.0	130
150W PMH	1.0	185
175W PMH	1.0	208
250W PMH	1.0	288
320W PMH	1.0	368
350W PMH	1.0	400
400W PMH	1.0	452
450W PMH	1.0	508
750W PMH	1.0	818
1000W PMH	1.0	1080

6
7 2.30 ELECTRONIC HID BALLASTS
8

9 A. Electronic HID ballasts shall operate only one lamp unless specifically called out on the
10 Luminaire Schedule or on the plans.

BALLAST DESCRIPTION	MIN. BALLAST FACTOR	MAX. BALLAST WATTAGE
20W PMH	1.0	23
39W PMH	1.0	44
50W PMH	1.0	
70W PMH	1.0	79
100W PMH	1.0	110
150W PMH	1.0	167
175W PMH	1.0	
250W PMH	1.0	269
320W PMH	1.0	344
350W PMH	1.0	376
400W PMH	1.0	430

11

1 2.31 ACCESSORIES

- 2
- 3 A. Lenses: Lenses for fluorescent fixtures shall be 100% virgin acrylic and have a nominal
- 4 thickness of 0.125 inch.
- 5
- 6 B. Emergency Battery Packs: Emergency battery packs shall be factory installed. All
- 7 emergency luminaire troffers shall operate at 1400 lumen or greater output for at least 90
- 8 minutes. All battery backups installed in exterior luminaires shall be rated for damp
- 9 location and rated to operate at 32°F.

10

11

12 PART 3 EXECUTION

13

14 3.1 SITE VERIFICATION OF CONDITIONS

- 15
- 16 A. Field verify existing conditions to determine luminaire quantities, spacing, location,
- 17 orientation, mounting height, input voltage, color, switching arrangement, etc. to install
- 18 in each space to properly serve the switching arrangement, lamp type, lamp quantity,
- 19 voltage, feeder condition, etc. of existing luminaires to be replaced or added to. All
- 20 replacement luminaires shall match these physical characteristics or the standard outlined
- 21 in this specification, whichever is greater.

22

23 3.2 INSTALLATION

- 24
- 25 A. Provide all luminaires of the types indicated, in accordance with NEMA standards,
- 26 manufacturer's recommendations, and NEC requirements.
- 27
- 28 B. Install indoor lighting systems in accordance with NECA/IESNA-500.
- 29
- 30 C. Install exterior lighting systems in accordance with NECA/IESNA-501.
- 31
- 32 D. Provide luminaires complete with lamps, ballasts, LED arrays, LED drivers, and other
- 33 accessories necessary for proper installation in the building construction and listed for
- 34 fire rated ceilings where required by code.
- 35
- 36 E. Lighting control: Provide switches with matching technology (Mark VII, Mark X, etc.)
- 37 for dimming ballasts in the locations shown on the drawings. Provide lighting controls
- 38 in accordance with section 26 09 23.13 - Motion Sensor Lighting Controls.
- 39
- 40 F. Emergency lighting: Provide a battery backup, transfer switch, internal wiring etc. in each
- 41 luminaire indicated as an emergency luminaire or night light. If a type designation is
- 42 omitted from an emergency luminaire then furnish a battery backup or automatic transfer
- 43 device in the standard luminaire and make it an emergency luminaire. In renovations
- 44 where existing luminaires are to be made into emergency luminaires and the unswitched
- 45 hot leg needed for proper operation does not exist, provide a new unswitched hot leg to
- 46 the luminaire as needed for proper operation. The unswitched hot wire must come from
- 47 the same branch circuit that powers the luminaire.

- 1
2 G. Verify that the specified luminaires are compatible with the specified ceiling systems as
3 indicated on the Architectural drawings. Advise the Architect/Engineer of any
4 discrepancies before placing the luminaire order.
5
6 H. Locate luminaires in mechanical and other similar equipment rooms to clear all
7 obstructions. Obtain approval from the architect or engineer before placing luminaires
8 where the location as shown on the drawings must be radically changed.
9
10 I. Support surface mounted luminaires from the building structure with a minimum of two
11 1/4 inch threaded rods per fixture. Use 1½ inch x 1½ inch steel framing channel where
12 required to span joists and otherwise facilitate structural support.
13
14 J. Mount recessed luminaires in the center of a ceiling tile or as shown on the drawings.
15 Provide support for recessed luminaires by means of bar hangers extended across the
16 main ceiling support members and also supported from the building structure.
17
18 K. Run fixture whips (flex conduit/metal clad cable) from a junction box to each fixture (not
19 to exceed four fixtures per junction box) access plate. Fixture whips between light fixtures
20 will not be accepted. Whips shall not be more than 6'-0" in total length.
21
22 L. Provide remote mounted ballasts for any HID luminaire used in a library or other space
23 where sound is a concern.
24
25 M. Locate all remote ballasts above the ceiling above each luminaire or in an adjacent room
26 with a low ceiling for easy access. Mount ballasts on rubber insulators.
27
28 N. Exit signs: Exit signs are not to be switched.
29
30 O. HID Burn-in: Burn-in all HID lamps 100 hours before occupancy by owner or tenant.
31 All HID lamps intended to be dimmed must be burned in for at least 100 hours at full
32 voltage before being dimmed.
33
34 P. Prior to final inspection, check all luminaires for damages during construction and replace
35 damaged luminaires at no additional expense to the Owner. Test all emergency luminaires
36 for proper operation, including exercising all transfer switching, battery backups,
37 generator, etc. All luminaires shall be cleaned and completely lamped at the time of final
38 acceptance of the building.
39

40 3.3 RE-INSTALLATION

- 41
42 A. This renovation project will require some HVAC ducts to be accessed or replaced. Tie all
43 existing luminaires to the structure in areas where ceiling is to be removed but the
44 luminaires are to be kept. Once the HVAC work is complete and the new or existing
45 ceiling is re-installed, drop the existing luminaires back into the existing locations in the
46 ceiling.
47

1 3.4 ADJUSTING

2

3

4

5

A. Move any luminaire up to six feet in any direction as directed at no additional cost.

END OF SECTION