
SECTION 00 26 00 - PROCUREMENT SUBSTITUTION PROCEDURES**1.1 DEFINITIONS**

- A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.
- B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 01 25 00 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 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.

1.3 PROCUREMENT SUBSTITUTIONS

- A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.
- B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:
 - 1. Extensive revisions to the Contract Documents are not required.
 - 2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
 - 3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

- A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing by prime contract Bidder only in compliance with the following requirements:
 - 1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
 - 2. Submittal Format: Submit three copies of each written Procurement Substitution Request, using form bound in Project Manual after Section 01 25 00 "Substitution Procedures."

- a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
- b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:
 - 1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
 - 2) Copies of current, independent third-party test data of salient product or system characteristics.
 - 3) Samples where applicable or when requested by Architect.
 - 4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. 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.
 - 5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - 6) Research reports evidencing compliance with building code in effect for Project, from ICC-ES or from code organization acceptable to Owner.
 - 7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.
- c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
- d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

- C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF SECTION 00 26 00

SECTION 01 10 00 - SUMMARY**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
1. Project information.
 2. Work covered by Contract Documents.
 3. Access to site.
 4. Coordination with occupants.
 5. Work restrictions.
 6. Specification and drawing conventions.
- B. Related Requirements:
1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: USD 320 Wamego School District Improvements.
1. Project Locations:
 - a. Central Elementary School, 900 7th Street, Wamego, KS 66547
 - b. West Elementary School, 1911 Sixth Street, Wamego, KS 66547
 - c. Wamego Middle School, 1701 Kaw Valley Road, Wamego, KS 66547
 - d. Wamego High School, 801 Lincoln, Wamego, KS 66547
 - e. Wamego Sports Complex-Highway 24 and Columbian Rd.
 - f. Wamego Facilities and Bus Operations, 4290 Columbian Rd.
 - g. District Office
- B. Owner: USD 320 Wamego School District, 1008 8th Street, Wamego, KS 66547.
1. Representative: Tim Winter, Superintendent.
- C. Architect: BBN Architects Inc., 228 Poyntz Avenue, Manhattan, KS 66502.
1. Representative: Dan Crouch; dlc@bbnarchitects.com

- D. Construction Manager at Risk: Coonrod and Associates Construction Company, Inc., 3550 S Hoover Rd, Wichita, KS 67215.
1. Representative: Brad Rice.
 2. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
1. Renovation of existing facilities and construction of construction of new facilities.
- B. Type of Contract: Project will be constructed under a single contract with the Construction Manager at Risk.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways and Entrances: Keep driveways, parking areas, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.

2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.
 1. Weekend Hours: 7:00 a.m. to 5:00 p.m., with Owner's written permission.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 1. Notify Owner not less than two days in advance of proposed utility interruptions indicating specific times of the interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Restricted Substances: Use of tobacco products and other controlled substances within the existing building or on Project site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 22 00 - UNIT PRICES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Section 01 40 00 "Quality Requirements" for field testing by an independent testing agency.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated into 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.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See 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: Maintenance and repair of existing steel roof deck.
 - 1. Description: Rust and superficial damage may be observed on existing steel roof deck after removal of phenolic insulation. Remove rust and apply appropriate coating materials to provide corrosion resistance.
 - 2. Unit of Measurement: Square foot (square meter) of steel deck repaired.

- B. Unit Price No. 2: Removal and replacement of damaged steel roof deck.
 - 1. Description: Extensive damage may be observed on existing steel roof deck after removal of phenolic insulation. Remove damaged deck panels and replace with new steel deck matching profile and material thickness. Installation of new deck panels shall be as indicated in manufacturer's installation instructions.
 - 2. Unit of Measurement: Square foot (square meter) of steel deck replaced.

- C. Unit Price No. 3: Cutting and patching of concrete slabs.
 - 1. Description: Cutting of existing concrete slabs-up to 6 inches (152 mm) thick and patching of concrete according to Section 01 73 00 "Execution." not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Square feet (Square meters) of concrete removed and replaced.

END OF SECTION 01 22 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Request for Substitution Form (RFS): Use facsimile of form following this Section.
 - 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.
 - 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 10 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

PART 2 - PRODUCTS**2.1 SUBSTITUTIONS**

- A. Substitutions 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

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Request for Substitution (RFS)

USD 320 Wamego School District Improvements Project Name

RFS No: _____
Date Issued: _____

Project Name: USD 320 Wamego School
District Improvement **Issued by:** _____
BBN Project No: _____ **Copies:** _____

Product, Material or Equipment Required of the Contract Documents:

Specification Section: _____ Drawing No./Detail: _____
Description: _____

Requested Substitute Product, Material or Equipment:

Description: _____
Manufacturer: _____ Trade Name: _____
Model Number: _____ Installer: _____

Attachments Included: Drawings Product Data Samples
 Test Reports Comparative Data

Reason for Substitution: _____

Has this item been used in a similar application? Yes No

Description: _____
Date Installed: _____
Owner Contact: _____

Comparisons of the Specified Item and the Proposed Substitution:

Compliance with specified quality, size, weight, durability, performance and visual appearance:
Describe any changes required in other elements of the Work:
Describe any changes of the Work required by the Owner, separate Contractors, or Consultants:
Verify all specified warranties, code and accessibility compliance, sustainability, and other requirements are met:
What affect with and without approval of the proposed substitution will there be on the Work Schedule:

Project Name: USD 320 Wamego School District
Improvements

RFS No: _____

Provide detailed breakdown of the cost comparison of the required item to the proposed substitution, including modifications required to other Work:

Proposed Substitution Summary:

Net Cost to the Owner:

Change in Contract Time:

Signatures:

Permission to make any substitution after Award of Contract shall be effected by Change Order (CO). CO shall not relieve the Contractor, any subcontractor, or manufacturer, fabricator, or supplier from the responsibility for any deficiency that may exist in the substituted product or any departures or deviations from the Contract Documents as modified by such CO. Except as otherwise expressly specified by the Contractor in the Request for Substitution (RFS) and expressly approved in such CO, the Contractor shall be deemed to warrant, by his request, that the proposed substitute will satisfy all standards and requirements satisfied by the original product, material or equipment specified and the CO shall not be deemed to modify the Contract Documents with respect thereto. If any substitution will affect a correlated function, adjacent construction, or the work of other trades or contractors, the necessary changes and modifications to the affected work shall be considered as an essential part of the proposed substitution, to be accomplished by the Contractor without additional expense to the Owner if and when accepted. The Contractor shall be deemed to warrant the Net Cost to the Owner and Change in Contract Time stated in this RFS are complete, and claims for additional Cost or Time related to the substitution which may become subsequently apparent are waived.

Contractor's Signature: _____ **Date:** _____

Response:	
RFS Action:	<input type="checkbox"/> Approved
	<input type="checkbox"/> Make Corrections Noted
	<input type="checkbox"/> Revise as Noted and Resubmit
	<input type="checkbox"/> Rejected, Resubmit Specified Item
	<input type="checkbox"/> Action Not Taken
	<input type="checkbox"/> More Information Required

RFS Response by: _____ **Date:** _____
BBN Architects, Inc.

BBN Architects, Inc. **Contractor:** _____ **Owner:** _____

Accepted By: _____ **Accepted By:** _____ **Accepted By:** _____

Date: _____ **Date:** _____ **Date:** _____

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.
 - 2. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedules.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one-line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703.
 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
 7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
11. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment-Application Times: The date for each progress payment is the last day of each month or as otherwise indicated in the Contract Agreement. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days prior to the date for each progress payment.
 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Sustainable design submittal for project materials cost data.
 4. Contractor's construction schedule (preliminary if not final).
 5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 6. Products list (preliminary if not final).
 7. Sustainable design action plans.
 8. Schedule of unit prices.
 9. Submittal schedule (preliminary if not final).
 10. List of Contractor's staff assignments.
 11. List of Contractor's principal consultants.

12. Copies of building permits.
 13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 14. Initial progress report.
 15. Report of preconstruction conference.
 16. Certificates of insurance and insurance policies.
 17. Performance and payment bonds.
 18. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
 - 5. Digital project management procedures.
- B. Related Requirements:
 - 1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each principal portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Digital Coordination Drawings: Two-dimensional documents, such as schedules, shop drawings, product data, and general information, shall be submitted electronically in portable document format (PDF) file.
- C. Key Personnel Names: Within five days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Provide coordinated composite drawings, drawn at a scale not less than 1/4 inch per foot in both plan and elevation, including, but not limited to, equipment, ducts, pipe sleeves, piping including plumbing and sprinkler systems, lighting, special supports and other items contained within the space and finished ceiling. Show mechanical and electrical services and architectural and structural features drawn to scale. Provide composite drawings for corridors, specialty spaces, electrical rooms, communication rooms, mechanical rooms, shafts, tunnels, and other areas of limited space with complex systems. Distribute copies of composite drawings to all trades to assure a complete, coordinated installation of work within the space available. Include elevation drawings indicating finish ceiling heights, and heights above finished floor to bottom of ductwork, piping, conduit and other overhead fixtures and equipment.
 - 1) Sheet Size: At least 8-1/2-by-11-inch (215-by-280-mm) paper but no larger than 30 by 40 inches (760 by 1016 mm).
 - 2) Draw required details at a scale not less than 3/4 inch per foot.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - 1) Scheduling, sequencing movement, and positioning of large equipment into the building during construction.

- a. Civil and electrical underground utilities, both new and existing.
 - b. Location of all building/site ground connections/rods.
9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.

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

- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect or AIA Document G716.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly, with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect and Construction Manager.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
- F. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven Insert number days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Web-Based Project Software: Use Construction Manager's web-based Project software site, "Submittal Exchange," for purposes of hosting and managing Project communication and documentation until Final Completion.
1. Web-based Project software site includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
 2. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

- A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

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

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

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Owner's partial occupancy requirements.
 - k. Installation of Owner's furniture, fixtures, and equipment.
 - l. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.

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

- 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Status of correction of deficient items.
 - 15) Field observations.
 - 16) Requests for interpretations (RFIs).
 - 17) Status of Proposal Requests (PRs).
 - 18) Pending changes.
 - 19) Status of Change Orders.
 - 20) Pending claims and disputes.
 - 21) Documentation of information for payment requests.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

- B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports and for electronic submittal requirements.
2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 2. Predecessor Activity: An activity that precedes another activity in the network.
 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
- B. Initial construction schedule.
 - 1. Approval of cost-loaded, initial construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Initial Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.

4. Earnings Report: Compilation of Contractor's total earnings from Notice to Proceed until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at weekly intervals.
- H. Material Location Reports: Submit at weekly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.
- J. Special Reports: Submit at time of unusual event.
- K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 10. Review and finalize list of construction activities to be included in schedule.
 11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from entities involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - a. Elevators.
 - b. Structural steel.
 - c. Modular bathrooms
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 1. Phasing: Arrange list of activities on schedule by phase.
 2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 3. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.

- d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
- a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:
- 1. Temporary enclosure and space conditioning.
 - 2. Completion of East Assisted Living Addition (Building A).
 - 3. Completion of Assisted Living Renovation and Addition (Building B).
 - 4. Completion of Community Space Upgrades (Building C).
 - 5. Completion of Independent Living Renovation and Elevator Addition (Building D).
 - 6. Completion of Specialty Care Assisted Living Facility (SCALF) Renovation (Building J).
 - 7. Completion of Short Term Stay Building (Building K)
 - 8. Completion of Long Term Care (LTC) Stand Alone (Building L).
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
- 1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.

- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 INITIAL CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit initial, horizontal, bar-chart-type construction schedule within 15 days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Initial Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the initial network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and commissioning.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.

4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (see special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

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

PART 3 - EXECUTION**3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE**

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 01 31 00 "Project Management and Coordination" for submittal requirements using "Submittal Exchange."
 - 2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Section 01 60 00 "Product Requirements" for administrative and procedural requirements for selection of products for use in Project.
 - 4. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 5. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 6. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager 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 initial construction schedule but prior to first application for payment. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Six-Week Look-Ahead Schedules: Maintain and update submittal schedules to reflect current conditions at the project site and project status. Submit revised submittal schedules highlighting the submittals planned in the subsequent six weeks.
 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 and Construction Manager's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Electronic Data: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals upon execution of AIA Document C106, Digital Data Licensing Agreement.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submittal items required for each Specification Section shall be submitted concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 5. Arrange for preparation of required submittals in sufficient detail to permit analysis and review by Architect and Construction Manager, sufficiently early to allow for review, and accommodate the rate of construction progress required under the Contract. Delete or mark out extraneous material not relevant to the Project.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on the first full working day following Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 consecutive working days for initial review of each submittal. processing must be delayed to permit coordination with subsequent submittals or if concurrent review is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination or concurrent review.
 2. Resubmittal Review: Allow 10 consecutive working days for review of each resubmittal.
 3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 consecutive working days for initial review of each submittal.
 4. Concurrent Consultant Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 15 working days for initial review of each submittal. Submittal will be returned to Construction Manager, through Architect, before being returned to Contractor.
 - a. Submit to concurrent reviewer, Architect, and Construction Manager.
 5. Extended Review: Allow 20 consecutive working days for initial review of the following submittals:
 - a. Coordination drawings.
 - b. Windows.
 - c. Door hardware.
 - d. Electronic security systems.
 - e. HVAC temperature controls.
 - f. HVAC balancing report.
 - g. If more than five shop drawings of a single trade are received in one week.
- D. Electronic Submittals: Two-dimensional documents, such as schedules, shop drawings, product data, and general information, shall be submitted electronically in portable document format (PDF) file. Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - 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. Other necessary identification.
 - s. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form as initial submittal.

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

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website, "Submittal Exchange." Enter required data in web-based software site to fully identify submittal.
 - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

2.2 ACTION SUBMITTALS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable. Delete or mark out extraneous material that is not applicable to the Work. Edit material to conform to project requirements, and to clearly show model number, type and size

- proposed. Provide additional information as necessary to supplement standard information.
3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's written recommendations.
 - d. Standard color charts.
 - e. Statement of compliance with specified referenced standards.
 - f. Testing by recognized testing agency.
 - g. Application of testing agency labels and seals.
 - h. Notation of coordination requirements.
 - i. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Mill reports.
 - e. Standard product operating and maintenance manuals.
 - f. Compliance with recognized trade association standards.
 - g. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shop fabrication instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship and attachment to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.

- o. Highlight deviations from the Contract Documents.
2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
 4. Do not use Shop Drawings for ordering, fabrication, or construction without an appropriate final stamp from the Construction Manager and Architect indicating action taken in connection with construction.
 5. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- C. Samples: Submit Samples for review of size, kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
1. Samples are required only for comparable products, substitutions, and custom fabricated items, unless samples are specifically required by the individual Sections.
 - a. Samples are not required and will not be reviewed if a specified item is being provided.
 - b. Samples are required and action will be taken if the specified item is no longer available, the manufacturer's current catalog numbers vary from those specified, named manufacturer's product data differs from requirements, or where custom colors require evaluation.
 2. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 3. Mount, or display, Samples to facilitate review of qualities specified. Prepare Samples to match the Architect's sample. Include the following identification label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number, submittal number, and generic name of each item.
 - f. Compliance with recognized standards.
 - g. Availability and delivery time.
 4. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
- a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

2.3 INFORMATIONAL SUBMITTALS

- A. Contractor's Submittal Schedule: Comply with requirements specified in this Section under SUBMITTAL ADMINISTRATIVE REQUIREMENTS.
- B. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."
- C. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- D. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."
- G. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."
- I. Project Record Documents: Comply with requirements specified in Section 01 78 39, "Project Record Documents."
- J. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."
- K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

- Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.4 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic calculation files, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 1. Architect and Construction Manager will take no action on submittals that have not been stamped and certified.

3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

- A. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. The review is for general conformance with the design concept and the information given in the construction documents. Corrections or comments made on the shop drawings/submittal during this review do not relieve Contractor from compliance with the requirements of the plans and specifications. Review of the specific item shall not include review of an assembly of which the item is a component. The contractor is responsible for: dimension to be confirmed and correlated at the job site; information that pertains solely to the fabrication processes or the means, methods, techniques, sequences and procedures of construction; coordination of the work with that of all other trades and performing all work in a safe and satisfactory manner.
- B. Construction Manager will stamp each submittal with an action stamp indicating review of submittal before forwarding to Architect.
- C. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 1. **"No Exceptions Taken"** - When the Architect marks a submittal "No Exceptions Taken," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 2. **"Make Corrections Noted"** - When the Architect marks a submittal "Make Corrections Noted," the Work covered by the submittal may proceed provided it complies with

- notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
3. **"Revise and Resubmit"** - When the Architect marks a submittal "Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - a. Do not use, or allow others to use, submittals marked "Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.
 4. **"Rejected"** - When the Architect marks a submittal "Rejected," do not proceed with Work covered by the submittal. The Work covered by the submittal does not conform to the design concept or meet Contract Document requirements.
 - a. Do not use, or allow others to use, submittals marked "Rejected – Submit Specified Item" at the Project Site or elsewhere where Work is in progress.
 5. **"Submit Specified Item"** - When the Architect marks a submittal "Submit Specified Item," do not proceed with Work covered by the submittal. The Work covered by the submittal does not conform to the design concept or meet Contract Document requirements. Prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - a. Do not use, or allow others to use, submittals marked "Rejected – Submit Specified Item" at the Project Site or elsewhere where Work is in progress.
 6. **"Action Not Taken"** - Where a submittal is for information or record purposes or special processing or other activity, the Architect will return the submittal marked "Action Not Taken."
- D. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- E. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.
- F. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- G. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Benchmarks: Samples that serve as standards by which other work may be measured or judged.
 - 1. Approved benchmark samples shall use full scale, on-site surface areas and spaces. These shall be prepared using the complete specified or approved paint, coating, or decorative system. The sample shall include complete systems.
 - 2. Benchmark samples for interior coating systems shall be prepared only after permanent lighting, heating, venting and air conditioning equipment have been installed and activated.

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

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
- C. Items indicated on the drawings but not included in the specifications, or included in the specifications and not indicated on the drawings, shall have the same effect as if indicated or included in both. In case of conflict or inconsistency between the drawings and the

specifications, the Contractor shall additional information or interpretation as specified in Section 01 31 00 "Project Management and Coordination." Any adjustment by the Contractor without such determination shall be at its own risk and expense.

1.5 ACTION SUBMITTALS

- A. **Qualification Data:** For Contractor-engaged testing agencies to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. **Delegated-Design Submittal:** In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 INFORMATIONAL SUBMITTALS

- A. **Contractor's Quality-Control Plan:** For quality-assurance and quality-control activities and responsibilities.
- B. **Qualification Data:** For Special Inspectors and Contractor's quality-control personnel.
- C. **Schedule of Tests and Inspections:** Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- D. **Reports:** Prepare and submit certified written reports and documents as specified.
- E. **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 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. **Quality-Control Plan, General:** Submit quality-control plan within 15 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. **Testing and Inspection:** In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. **Continuous Inspection of Workmanship:** Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements.
- F. **Monitoring and Documentation:** Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

- A. **Test and Inspection Reports:** Prepare certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.

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

1.9 QUALITY ASSURANCE

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

- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade jurisdiction settlements and similar conventions.
- 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. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 2. **Testing Agency Responsibilities:** Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. **Benchmarks:** Benchmark samples shall be prepared to establish full scale, on-site surfaces to serve as standards by which subsequent work may be measured or judged. Each sample shall be prepared using the complete specified products, materials, or systems.

1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including

service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

- E. **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.
- F. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- G. **Associated Contractor Services:** Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.11 SPECIAL TESTS AND INSPECTIONS

- A. **Special Tests and Inspections:** Engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated on Sheet S201 of the Structural Drawings, and as follows:
 - 1. Information for the proposed special inspections firm shall be submitted to the Owner, Architect, and Structural Engineer for approval.
 - 2. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
 - 3. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 4. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, with copy to Contractor and to authorities having jurisdiction.

5. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
6. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
7. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the General Conditions of the Contract for Construction.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
 - 1. "Installer": Entity engaged by the Contractor, either as an employee or subcontractor, to perform an "Install" construction activity.
 - a. Installer shall be experienced in the operations they are engaged to perform.
 - 2. "Experienced Installer": Entity that has successfully completed a minimum of five previous projects similar in size and scope to this Project; is familiar with the special requirements indicated; and has complied with requirements of authorities having jurisdiction.
- H. "Provide": Furnish and install, complete and ready for the intended use.

- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

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

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Materials, equipment, and operations specified by reference to published standards and specifications of a technical society, trade association, or other agency standard, shall comply with the requirements of the current edition of the listed document that is in effect on the issue date of the Specifications or Addendum page making reference thereto, unless otherwise specified. Make available at site, copies of referenced documents as Owner's Representative or Architect may request.
 1. No Provision of a reference standard, specification, manual, or code shall be effective to change the duties and responsibilities of the Owner, the Contractor, the Architect and their consultants, their agents and employees from those duties and responsibilities set forth in the Contract Documents.
- C. 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. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 2. ICC - International Code Council; www.iccsafe.org.
 3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. 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. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
2. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
3. DOD - Department of Defense; www.quicksearch.dla.mil.
4. DOE - Department of Energy; www.energy.gov.
5. EPA - Environmental Protection Agency; www.epa.gov.
6. FG - Federal Government Publications; www.gpo.gov.
7. HUD - Department of Housing and Urban Development; www.hud.gov.
8. OSHA - Occupational Safety & Health Administration; www.osha.gov.
9. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
10. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
11. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
12. USPS - United States Postal Service; www.usps.com.

E. 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. FED-STD - Federal Standard; (See FS).
3. 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.
4. MILSPEC - Military Specification and Standards; (See DOD).
5. USAB - United States Access Board; www.access-board.gov.
6. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. 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. ADPH: Alabama Department of Public Health

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

- D. **Moisture-Protection Plan:** Describe procedures and controls for protecting materials and construction from water absorption and damage.
1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
- E. **Dust- and HVAC-Control Plan:** Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
1. Locations of dust-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste-handling procedures.
 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. **Electric Service:** Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. **Tests and Inspections:** Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. **Accessible Temporary Egress:** Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **Chain-Link Fencing:** Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.

- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).
- D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures".
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 01 10 00 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
 1. Water Service: Access to Owner's existing water service facilities may be allowed at the discretion of the Owner. Water service facilities shall be cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, these facilities shall be restored to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 1. Toilets: Use of Owner's existing toilet facilities may be permitted at the discretion of the Owner. If permitted, facilities shall be cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, these facilities shall be restored to condition existing before initial use.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- H. Electric Power Service: Connect to Owner's existing electric power service provided the service is of sufficient size, capacity, and power characteristic required for construction operations. Maintain equipment in a condition acceptable to Owner.
1. If required, install electric power service overhead unless otherwise indicated.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.

2. Prepare subgrade and install subbase and base for temporary roads and paved areas as indicated on the Drawings.
 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.
- F. Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 01 10 00 "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
1. Extent of Fence: As indicated on Drawings.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 2. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.
 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 4. Insulate partitions to control noise transmission to occupied areas.
 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 6. Protect air-handling equipment.
 7. Provide walk-off mats at each entrance through temporary partition.
- M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 3. Indicate methods to be used to avoid trapping water in finished work.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.

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

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary office spaces, enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. At Substantial Completion, restore Owner-allocated office spaces to condition existing before initial use,
 2. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
 - 1. Where applicable, materials and construction shall be in accordance with the City of Edmond Standard Specifications for Construction (Standard Specifications) and Construction Standards.
- B. Related Requirements:
 - 1. Section 01 42 00 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 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.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.7 PRODUCT WARRANTIES

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

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
- B. Provide materials and equipment that are of good quality and new, unless otherwise specified, are free from faults and defects not inherent in the quality required, that conform with requirements of Contract Documents, that are suitable for use and function intended, that are corresponding in quality to related materials in the absence of a complete specification, that are of quality appearance where exposed to view, that are of one manufacturer or source for the same specific purpose, with uniform appearance and physical properties, and that are identical and interchangeable when required in quantity
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.
 - a. The Architect is solely responsible for evaluation of products and manufacturers submitted as "Or equal" to the specified product or manufacturer.
 - b. Submit additional documentation required by Architect through Construction Manager in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final.
- C. Product Selection Procedures:
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.
 - 1) Comparable products will be considered unless otherwise indicated.
 - 2) Substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "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.
 - 1) Comparable products will be considered unless otherwise indicated.
 - 2) Substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - 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.
- D. 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.

- E. 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

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

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

- B. Related Requirements:

1. Section 01 10 00 "Summary" for limits on use of Project site.
2. Section 01 31 00 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
3. Section 01 33 00 "Submittal Procedures" for submitting surveys.
4. Section 01 74 49 "Construction Waste Management and Disposal" for administrative and procedural requirements for disposal and salvaging of nonhazardous demolition and construction waste.
5. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Certified Surveys: Submit two copies signed by land surveyor.
- D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. General: Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Cementitious Materials: Portland Cement: ASTM C 150/C 150M, Type I/II.
- D. Lightweight Aggregate: ASTM C 330/C 330M, 1-inch (25-mm) nominal maximum aggregate size.
- E. Structural Lightweight Concrete Mix: ASTM C 330/C 330M, proportioned to produce concrete with a minimum compressive strength of 3000 psi (20.7 MPa) at 28 days and a calculated equilibrium unit weight of 110 lb/cu. ft. (1762 kg/cu. m) plus or minus 3 lb/cu. ft. (48.1 kg/cu. m), as determined by ASTM C 567/C 567M. Concrete slump at point of placement shall be the minimum necessary for efficient mixing, placing, and finishing.
- F. Air-Entraining Admixture: ASTM C 260/C 260M.
- G. Water: ASTM C 94/C 94M.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

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

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

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

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, reference points, stakes, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- B. Except where more stringent requirements are specified, prepare, install, test, adjust and clean products, materials and equipment in accordance with manufacturer's printed instructions, recommendations and limitations for conditions indicated. Provide recommended accessory materials for a complete installation. If conflict exists between job conditions or specified requirements and with manufacturer's instructions, request written clarification from Architect before proceeding.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

- E. Coordination of Space: Where space is limited, install components and systems to maximize space available for maintenance and ease of removal for replacement.
- F. Concealed Work: In finished areas, except as otherwise indicated, conceal pipes, ducts, conduit and wiring in the finished construction. Coordinate locations of fixtures, outlets, access panels, and similar items with finish elements. Provide escutcheon plates at penetrations through finished walls, ceilings and floors, with finish appropriate to adjacent finished surface.
- G. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- H. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- I. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- J. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- K. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- L. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall

coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Concrete Floor Slabs: Where sections of concrete floor are removed for new piping and drain lines, fill in opening with reinforced concrete. Provide an even surface of uniform finish and appearance.
 - a. Reinforcing: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - b. Concrete Placement: Comply with ACI 301 (ACI 301M) for placing concrete.
 - c. Finishing: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
 - 1) Match existing concrete surfaces.
 5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 49 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
1. Excessive static or dynamic loading.
 2. Excessive internal or external pressures.
 3. Excessively high or low temperatures.
 4. Excessive winds.
 5. Thermal shock.
 6. Excessively high or low humidity.
 7. Pollution and air contamination.
 8. Water or ice.
 9. Chemicals and solvents.
 10. Light.
 11. Radiation.
 12. Puncture.
 13. Abrasion.
 14. Heavy traffic.
 15. Soiling, staining, and corrosion.
 16. Bacteria.
 17. Rodent and insect infestation.
 18. Combustion.
 19. Electrical current.
 20. High-speed operation.

21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft or vandalism.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.
- C. Owner reserves the right to protect installed Work to prevent damage and deterioration if the Contractor fails to protect the installed Work in a proper manner. The costs incurred by the Owner shall be paid by the Contractor.

END OF SECTION 01 73 00

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 04 20 00 "Unit Masonry" for disposal requirements for masonry waste.

1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste for deposit in landfill or designated spoil areas on Owner's property.
- D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

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

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for the Notice of Award.

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons (tonnes).
 - 4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
- B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- C. Qualification Data: For waste management coordinator.
- D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- E. Refrigerant Recovery: Comply with requirements in Section 02 41 19 "Selective Demolition" for refrigerant recovery submittals.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- B. Preconstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work in compliance with Section 02 41 19 "Selective Demolition."
 - 2. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate salvage of materials.

PART 3 - EXECUTION**3.1 PLAN IMPLEMENTATION**

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Construction Manager's Superintendent will coordinate implementation, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged.
 2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Comply with requirements in Section 02 41 19 "Selective Demolition" for salvaging demolition waste.
- B. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.

- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.

END OF SECTION 01 74 19

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for administrative submittal requirements and electronic submittal requirements.
 - 2. Section 01 73 00 "Execution" for progress cleaning of Project site.
 - 3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 5. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 6. Sections of Divisions 21 through 28 for specific closeout requirements relate to mechanical, electrical and plumbing systems.

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.

- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 working days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of Punch List items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.
- E. Architect's Inspection for Substantial Completion: Except with the consent of the Owner, the Architect will perform no more than 2 inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents.
1. The Owner will be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections.
 - a. Cost of the Architect's additional services will be calculated in accordance with the hourly rates included in the Agreement between Owner and Architect.
 - b. Architect will issue a deduct Change Order in the amount of Architect's additional services.
 - c. Owner will deduct the amount of Architect's additional services from final payment to Contractor.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment.
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (Punch List), endorsed

- and dated by Architect. Final version of the Punch List shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 working days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or a form acceptable to the Architect.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect and Construction Manager .
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. PDF electronic file. Architect, through Construction Manager, will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 working days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

- C. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Designate specific warranties that will be included in operation and maintenance manuals
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Clean ceramic tile walls and floors.
- j. Clean, buff and wax resilient floors.
- k. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- l. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- m. Remove labels that are not permanent.
- n. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- o. Clean plumbing fixtures, accessories, and trim to a sanitary condition, free of stains, including stains resulting from water exposure.
- p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
- r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- s. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements established by Construction Manager.

D. Pest Control: Comply with pest control requirements established by Construction Manager. Prepare written report.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.

- a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

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

1.4 CLOSEOUT SUBMITTALS

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

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

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

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

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

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

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:

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

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

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

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

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

- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."
- G. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for electronic submittal requirements.
 - 2. Section 01 73 00 "Execution" for final property survey.
 - 3. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
 - 4. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Sections in Divisions 02 through 49 for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Submit PDF electronic files of scanned record documents to the Owner. Include all documents, whether changes were made or not.
 - a. Final Submittal: Submit PDF electronic files of scanned record prints, including one set of prints with no changes.
- 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: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 ELECTRONIC DATA

- A. Electronic Data: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals upon execution of AIA Document C106, Digital Data Licensing Agreement.

2.2 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.

- m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
- 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
- 1. Format: 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 through Construction Manager for resolution.
 - 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. Architect will provide data file layer information. Record markups in separate layers.
- 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. Record Prints: Organize record prints and newly prepared record Drawings into manageable data file sets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. 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.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.

- c. Designation "PROJECT RECORD DRAWINGS."
- d. Name of Architect and Construction Manager.
- e. Name of Contractor.

2.3 RECORD SPECIFICATIONS

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

2.4 RECORD PRODUCT DATA

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

2.5 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION**3.1 RECORDING AND MAINTENANCE**

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

END OF SECTION 01 78 39

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SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.

- d. Name of Contractor.
 - e. Date of video recording.
2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
 3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
 4. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

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

PART 2 - PRODUCTS**2.1 INSTRUCTION PROGRAM**

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- 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. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. 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.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.
- F. 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.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
 - 1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
 - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the

following for each Contractor involved on the Project, arranged according to Project table of contents:

- a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
1. Furnish additional portable lighting as required.
- E. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- F. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

SECTION 02 41 19 - SELECTIVE DEMOLITION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 01 73 00 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse [**store**].
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

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

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Universal certified by EPA-approved certification program.

1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 COORDINATION

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

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

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

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

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

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

- g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
 2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 PROTECTION

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

3.6 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain fire watch during and for at least 4 hours after flame-cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 10. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.7 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section **<Insert Section number and title>** for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.9 CLEANING

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

3.10 SELECTIVE DEMOLITION SCHEDULE

- A. Remove: <Insert description of items and construction to remove>.
- B. Remove and Salvage: <Insert description of items to remove and salvage>.
- C. Remove and Reinstall: <Insert description of items to remove and reinstall>.
- D. Existing to Remain: <Insert description of items to remain>.
- E. Dismantle: <Insert description of items to be removed>.

END OF SECTION 02 41 19

SECTION 07 01 50 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Full tear-off of roof system at areas indicated on Drawings.
 - 2. Removal of flashings, counterflashings, insulation, fasciae, gutters and downspouts.
 - 3. Temporary roofing.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for use of premises and for phasing requirements.
 - 2. Section 01 22 00 "Unit Prices" for repair or replacement of existing steel roof deck.
 - 3. Section 01 50 00 "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.

1.3 DEFINITIONS

- A. Full Roof Tear-off: Removal of existing roofing system down to existing metal roof deck, except for wood blocking that is in good condition.
- B. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.
- C. Roof Re-Cover Preparation: Existing roofing system is to remain and be prepared for new roof installed over it.

1.4 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.
 - 1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:

- a. Reroofing preparation, including roofing system manufacturer's written instructions.
- b. Temporary protection requirements for existing roofing system components that are to remain.
- c. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
- d. Sequence of activities and duration between activities.
- e. Existing roof deck conditions requiring Architect notification.
- f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
- g. Structural loading limitations of roof deck during reroofing.
- h. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
- i. Governing regulations and requirements for insurance and certificates if applicable.
- j. Existing conditions that may require Architect notification before proceeding.
- k. Site use and access.

1.5 ACTION SUBMITTALS

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

1.6 INFORMATIONAL SUBMITTALS

- A. Field Test Reports:
 1. Fastener pull-out test report.
- B. Equipment Loads: Provide dynamic and uniformly distributed loads for rooftop equipment to be used on adjacent roof areas.
- C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations.
 1. Submit before Work begins.
- D. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Comply with governing EPA notification regulations before beginning roofing removal.
 2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.8 FIELD CONDITIONS

- A. Existing Roofing System: Standing seam metal roofing with phenolic insulation.
- B. Owner will occupy portions of building immediately below reroofing area.
 - 1. Conduct reroofing so Owner's operations are not disrupted.
 - 2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
 - 3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
 - 4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.
 - a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.
- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
 - 1. Construction Drawings and Project Manual for existing roofing system are available for Contractor's convenience and information, but they are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.
 - a. Contact the Architect for access to these documents.
- E. Limit construction loads on existing roof areas to remain. Provide loads for rooftop equipment to be used on roof areas for review by Structural Engineer.
- F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
 - 1. Remove only as much roofing in one day as can be made watertight in the same day.
- G. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. Existing roof will be left no less watertight than before removal.
 - 3. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
 - a. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS**2.1 TEMPORARY ROOFING MATERIALS**

- A. Design and selection of materials for temporary roofing are Contractor's responsibilities.
- B. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).
- C. Base Sheet: ASTM D 4601/D 4601M, Type II, nonperforated, asphalt-impregnated and -coated, glass-fiber sheet.
- D. Glass-Fiber Felts: ASTM D 2178/D 2178M, Type IV, asphalt-impregnated, glass-fiber felt.
- E. Asphalt Primer: ASTM D 41/D 41M.
- F. Roofing Asphalt: ASTM D 312/D 312M, Type III or IV.
- G. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approvals' RoofNav.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Protection of In-Place Conditions:
 - 1. Protect existing roofing system that is not to be reroofed.
 - 2. Limit traffic and material storage to areas of existing roofing that have been protected.
 - 3. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
 - 4. Comply with requirements of existing roof system manufacturer's warranty requirements.
- B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- C. Protect vents and flues. Do not block systems requiring venting.
- D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
 - 1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

3.2 ROOF TEAR-OFF

- A. Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- C. Remove protection mat and phenolic insulation.
 - 1. Discard phenolic insulation.
- D. Full Roof Tear-off: Where indicated on Drawings, remove existing roofing and other roofing system components down to the existing roof deck.
 - 1. Remove standing seam metal roofing, roof insulation, vapor barrier, and other accessories down to existing metal roof deck.
 - 2. Remove base flashings and counter flashings.
 - 3. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
 - 4. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry.
 - 5. Remove fasteners from deck or cut fasteners off slightly above deck surface.
- E. Wood Blocking: Do not remove wood blocking unless inspection indicates deterioration and damage.
 - 1. If wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.
 - 1. Do not proceed with installation until directed by Architect.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.
 - 1. Do not proceed with installation until directed by Architect.
- D. Replace steel deck as directed by Architect.
 - 1. Deck replacement will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.
- E. Prepare and paint steel deck surface.

3.4 INFILL MATERIALS INSTALLATION

- A. Install new roofing patch over roof infill area.
 - 1. If new roofing is installed the same day tear-off is made, roofing patch is not required.

3.5 TEMPORARY ROOFING

- A. Install approved temporary roofing over area to be reroofed.
- B. Remove temporary roofing before installing new roofing.

3.6 FASTENER PULL-OUT TESTING

- A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to Architect and roofing manufacturer before installing new roofing system.
 - 1. Obtain Architect's approval to proceed with specified fastening pattern.
 - a. Roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.7 DISPOSAL

- A. Collect demolished materials and place in containers.
 - 1. Promptly dispose of demolished materials.
 - 2. Do not allow demolished materials to accumulate on-site.
- B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 07 01 50

SECTION 07 41 16 - STANDING-SEAM METAL ROOF PANELS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes standing-seam metal roof, fascia panels, substrate boards, underlayment, and rigid insulation.
- B. Related Sections:
 - 1. Section 07 01 50 "Preparation for Reroofing" for removal of existing standing seam metal roofing system and protection of exposed surfaces.
 - 2. Section 07 72 53 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof and fascia accessories and roof-mounted equipment.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review structural loading limitations of deck during and after roofing.
 - 6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
 - 7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 8. Review temporary protection requirements for metal panel systems during and after installation.
 - 9. Review procedures for repair of metal panels damaged after installation.
 - 10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; insulation, details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, fasciae, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Calculations: Include calculations with registered engineer seal, verifying roof panel and attachment method resist wind pressures imposed on it pursuant to applicable building codes.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- C. Benchmark Samples (Mockups): Provide a complete benchmark sample of a complete section of roof system.

1. Once sequence of removal of existing roofing and installation of new materials is established, the Architect will designate a specific roof area for constructing the benchmark sample to demonstrate the complete system.
 - a. Roof Surfaces: Construct at least 400 square feet (36 sq. m).
2. Approval of benchmark does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved benchmark shall remain undisturbed throughout the construction period.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.
- E. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Roof Live Load: 20 psf
 2. Flat-Roof Snow Load: 22 psf
 3. Snow Exposure Factor: $C_e=1.0$
 4. Basic wind speed (3-second gust):
 - a. $V_{ult} = 120$ mph Ultimate
 - b. $V_{asd} = 93$ mph Nominal
 5. Wind exposure category: C
 6. Deflection Limits: For wind loads, no greater than 1/240 of the span.

- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 at the following test-pressure difference:
1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).
- D. Wind-Uplift Resistance: Provide metal roof and fascia panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
1. Uplift Rating: UL 90.
- E. FM Global Listing: Provide metal roof and fascia panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A- 90.
 2. Hail Resistance: SH.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING-SEAM METAL ROOF AND FASCIA PANELS

- A. General: Provide factory-formed metal roof and fascia panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. **Vertical-Rib, Snap-Joint**, Standing-Seam Metal Roof and Fascia Panels: Formed with vertical ribs at panel edges and smooth striated pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Berridge Manufacturing Company; Berridge Cee-Lock or comparable product by one of the following:
 - a. CENTRIA Architectural Systems.

- b. Fabral.
 - c. MBCI; a division of NCI Group, Inc.
 - d. Petersen Aluminum Corporation.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.029 inch (0.74 mm) minimum.
 - b. Exterior Finish: Three-coat fluoropolymer.
 - c. Color: Berridge, Colonial Red.
 3. Clips: Continuous clips with vinyl weatherseal insert to accommodate thermal movement and clip bearing plates for rigid insulation.
 - a. Material: 0.029 inch (0.74 mm) nominal thickness, G90 (Z180) hot-dip zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 4. Joint Type: Single folded.
 5. Panel Coverage: 16.5 inches (419 mm).
 6. Panel Height: 1.5 inches (38 mm).
- C. **Vertical-Rib, Seamed-Joint**, Standing-Seam Metal Roof and Fascia Panels: Formed with vertical ribs at panel edges and smooth striated pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Berridge Manufacturing Company; Berridge Zee-Lock or comparable product by one of the following:
 - a. CENTRIA Architectural Systems.
 - b. Fabral.
 - c. MBCI; a division of NCI Group, Inc.
 - d. Petersen Aluminum Corporation.
 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.029 inch (0.74 mm) minimum.
 - b. Exterior Finish: Three-coat fluoropolymer.
 - c. Color: Berridge, Colonial Red.
 3. Clips: Continuous clips with vinyl weatherseal insert to accommodate thermal movement and clip bearing plates for rigid insulation.

- a. Material: 0.029 inch (0.74 mm) nominal thickness, G90 (Z180) hot-dip zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
4. Joint Type: Single folded.
5. Panel Coverage: 16 inches (406 mm).
6. Panel Height: 2.0 inches (51 mm).

2.3 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board or ASTM C 1278/C 1278M, fiber-reinforced gypsum board.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Georgia-Pacific Building Products.
 - c. National Gypsum Company.
 2. Thickness: 1/4 inch (6 mm) thick.
 3. Surface Finish: Factory primed.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 40 mils (1.02 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
 3. Basis-of-Design Product: Subject to compliance with requirements, provide "Grace Ice & Water Shield® HT", GCP Applied Technologies Inc. (formerly Grace Construction Products) or comparable product by one of the following:
 - a. Carlisle Residential; a division of Carlisle Construction Materials.
 - b. Drexel Metals.
 - c. GCP Applied Technologies Inc. (formerly Grace Construction Products).
 - d. Henry Company.
 - e. Owens Corning.
- B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

2.5 COMPOSITE INSULATED ROOF SHEATHING

- A. Plywood-Surfaced, Polyisocyanurate-Foam Sheathing: ASTM C 1289, Type V with DOC PS 2, Exposure 1, plywood on one face and felt or glass-fiber mat facer on the other surface.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Roofing Corporation.
 - b. Cornell Corporation.
 - c. Dow Chemical Company (The).
 - d. Johns Manville; a Berkshire Hathaway company.
 - e. Rmax, Inc.
 2. Polyisocyanurate-Foam Thickness: 2-1/8 inches (54 mm).
 3. CDX Plywood: 5/8 inch (15.9 mm).
 4. Compressive Strength: 25 psi (172 kPa).
 5. Size: 48 by 96 inches (1219 by 2438 mm).
 6. Thickness: 2.75 inches (70 mm).

2.6 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters: Formed from same material as roof and fascia panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated

from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof and fascia panels.

- E. Downspouts: Formed from same material as roof and fascia panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.
- F. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.7 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.8 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine primary and secondary roof and fascia framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof and fascia panel manufacturer.
 2. Examine solid roof and fascia sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof and fascia panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches (610 mm) in adjacent rows.
 - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 - 2. Tightly butt substrate boards together.
 - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.4 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply over the entire roof and fascia surface.

3.5 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Substrate Board:

1. Install base layer of insulation with joints staggered not less than 24 inches (610 mm) in adjacent rows.
 - a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - b. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
 - c. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - d. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
- D. Felt: Apply felt over plywood face of insulation over the entire roof surface, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).

3.6 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels to be level to 1/4 inch in 20 ft. (6 mm in 6.1 m).
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Locate and space fastenings in uniform vertical and horizontal alignment.
 4. Install flashing and trim as metal panel work proceeds.
 5. Panels should be continuous without end laps.
 6. Align bottoms of metal panels and fasten.
 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof and fascia panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof and Fascia Panel Installation: Fasten metal roof and fascia panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 1. Install clips to substrate with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. **Seamed Joint:** Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof and fascia panel, and factory-applied vinyl waetherseal are completely engaged.
 4. **Snap Joint:** Nest standing seams and fasten together by interlocking and completely engaging factory-applied vinyl weatherseal.
 5. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof and fascia panel manufacturers; or, if not indicated, types recommended by metal roof and fascia panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
1. Provide elbows at base of downspouts to direct water away from building.

- J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.8 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof and fascia panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof and fascia panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 16

SECTION 07 72 53 - SNOW GUARDS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Rail-type, seam-mounted snow guards.

1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guards.
- B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.
 - 1. Include details of rail-type snow guards.
 - 2. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.
- C. Samples: Base, bracket, and 12-inch- (300-mm-) long rail.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of snow guard, for tests performed by manufacturer and witnessed by a qualified testing agency.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- B. Structural Performance: Provide snow guard systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Roof Live Load: 20 psf
 2. Flat-Roof Snow Load: 22 psf
 3. Snow Exposure Factor: $C_e=1.0$
 4. Basic wind speed (3-second gust):
 - a. $V_{ult} = 120$ mph Ultimate
 - b. $V_{asd} = 93$ mph Nominal
 5. Wind exposure category: C
 6. Deflection Limits: For wind loads, no greater than $1/240$ of the span.

2.2 RAIL-TYPE SNOW GUARDS

- A. Seam-Mounted, Rail-Type Snow Guards:
1. Basis-of-Design Product: Subject to compliance with requirements, provide S-5! Attachment Solutions; Metal Roof Innovations, Ltd.; DualGard or comparable product by one of the following:
 - a. Alpine SnowGuards, a division of Vermont Slate & Copper Services, Inc.
 - b. Berger Building Products, Inc.
 - c. Rocky Mountain Snow Guards, Inc.
 2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with two rails.
 3. Material and Finish: Stainless steel; mill.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
1. Verify compatibility with and suitability of substrates including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
- B. Attachment for Standing-Seam Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing, or fastening methods that void metal roofing finish warranty.
2. Seam-Mounted, Rail-Type Snow Guards: Stainless-steel clamps attached to each vertical rib of standing-seam metal roof panels at the edge of the roof.

END OF SECTION 07 72 53

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Vinyl composition floor tile.
- B. Related Sections include the following:
 - 1. Section 09 65 13 "Resilient Wall Base and Accessories" for resilient wall base, reducer strips, and other accessories installed with resilient floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
- C. Product Schedule: For floor tile. Use same designations indicated in the Finish Legend.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Benchmark Samples: Before installing vinyl tiles, construct benchmark samples as a component of the Room Mockup specified in Section 01 40 00 "Quality Requirements." Include each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build benchmark samples to comply with the following requirements, using materials indicated for completed work:
1. Notify Architect seven days in advance of the dates and times when benchmark samples will be constructed.
 2. Demonstrate the proposed range of aesthetic effects and workmanship.
 3. Obtain Architect's approval of benchmark samples before starting construction of vinyl tiles.
 4. After finishes are accepted, Architect will use the room or surface to evaluate flooring systems of a similar nature.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE (VCT-1)

- A. Basis-of-Design Products: The design is based on the designated products. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers specified. Comparable products are subject to review and approval through the submittal process specified.
 - 1. Color 1: Subject to compliance with requirements, provide Armstrong World Industries, Inc., Excelon Feature Tile, 56814 Taupe II.
 - 2. Color 2: Subject to compliance with requirements, provide Armstrong World Industries, Inc., Imperial Texture Standard Excelon, 51915 Charcoal.
 - 3. Color 3: Subject to compliance with requirements, provide Armstrong World Industries, Inc., Imperial Texture Standard Excelon, 51814 Pomegranate Red.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Congoleum Corporation.
 - 2. Johnsonite; a Tarkett company.
 - 3. Mannington Mills, Inc.
- C. Tile Standard: ASTM F 1066, Class 2, through pattern.
- D. Wearing Surface: Smooth.
- E. Thickness: 0.125 inch (3.2 mm).
- F. Size: 12 by 12 inches (305 by 305 mm).

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Moisture and alkali-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
 - 1. Available Product: Armstrong Flooring S-750 Premium Tile Flooring Adhesive.

- a. VOC content: 5 g/L or less; calculated and reported, SCAQMD 1168.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.
1. Available Product: Armstrong Flooring S-480 Commercial Floor Polish

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
1. Remove any existing adhesive residue so that 100 percent of the overall area of the original substrate is exposed.
- B. Concrete Substrates: Prepare according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 5 lb of water/1000 sq. ft. (2.26 kg of water/92.9 sq. m) in 24 hours.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis, unless otherwise indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction, unless otherwise indicated.
- D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including columns, built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- E. Extend tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Hand roll tiles according to tile manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply three coats.
- E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Resilient thermoset-rubber base.
 - 2. Rubber molding accessories.
- B. Related Sections:
 - 1. Section 09 68 13 "Tile Carpeting" for modular carpeting which transitions to concrete floors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.
- C. Product Schedule: For resilient products. Use same designations indicated in the Finish Legend.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

- B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).
- C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.7 FIELD CONDITIONS

- A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive resilient products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- B. Do not install products until they are at the same temperature as the space where they are to be installed.
- C. For resilient products installed on traffic surfaces, close spaces to traffic during installation and for time period after installation recommended in writing by manufacturer.
- D. Coordinate resilient product installation with other construction to minimize possibility of damage and soiling during remainder of construction period. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE (R)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Roppe Corporation, USA Pinnacle Rubber Base or comparable product by one of the following:
 - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 2. Flexco.

3. Johnsonite; a Tarkett company.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset).
 1. Group: I (solid, homogeneous).
 2. Style and Location:
 - a. Style A, No Toe (Straight): Provide in areas with modular carpeting.
 - b. Style B, Standard Toe: Provide in areas with floor sealer and VCT.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (100 mm).
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Color: 123 Charcoal.

2.2 RUBBER MOLDING ACCESSORY

- A. Basis of Design: Subject to compliance with requirements, provide Roppe Corporation, USA, Rubber Accessories or comparable products by one of the following:
 1. VPI Corporation.
- B. Description: Rubber carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, and joiner for tile and carpet, and transition strips.
- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories at changes in flooring types. Refer to details on the Drawings.
- E. Color: 123 Charcoal.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant, VOC free, type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 1. Available products include the following:

- a. Excelsior Products C-630 Water-Based Contact Adhesive
 - 1) VOC content: 0.0 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. General: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Broom and vacuum clean substrates to be covered immediately before installing resilient products. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 RESILIENT BASE INSTALLATION

- A. General: Install wall base products according to manufacturer's written installation instructions.
- B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
 - 1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
 - 2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 3. Do not stretch base during installation.

4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- C. Job-Formed Corners:
1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Form without producing discoloration (whitening) at bends.
 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient and aluminum accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.
- C. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

3.5 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing resilient products:
 1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
 2. Sweep or vacuum horizontal surfaces thoroughly.
 3. Do not wash resilient products until after time period recommended by resilient product manufacturer.
 4. Damp-mop or sponge resilient products to remove marks and soil.
- B. Protect resilient products against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by resilient product manufacturer.
 1. Cover resilient products installed on floors with undyed, untreated building paper until inspection for Substantial Completion.

END OF SECTION 09 65 13

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SECTION 09 68 13 - TILE CARPETING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes modular carpet tile and walk-off carpet tile
- B. Related Requirements:
 - 1. Section 09 65 19 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. 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 of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. 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 at locations and in sizes 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.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 WALK-OFF CARPET TILE (Walk-Off CPT)**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide J&J Invision; J&J Industries, Inc., Catwalk Walk-Off Modular 7010 or comparable product by one of the following:
 - 1. Bentley Prince Street, Inc.
 - 2. Interface, LLC.
 - 3. Mannington Mills, Inc.
 - 4. Milliken & Company.
 - 5. Mohawk Group (The); Mohawk Carpet, LLC.
 - 6. Patcraft; a division of Shaw Industries, Inc.

7. Philadelphia Commercial; a division of Shaw Industries, Inc.
 8. Shaw Contract Group; a Berkshire Hathaway Company.
 9. Tandus; a Tarkett company.
- B. Colors: Spotlight 1427.
- C. Construction: Textured patterned loop.
- D. Fiber Type: "Encore SD."
- E. Face Weight: 34 oz/sq yd (1,153 g/m²)
- F. Gauge: 1/8 (3.15 rows/cm).
- G. Stitches: 9.5/in (3.74/cm)
- H. Primary Backing/Backcoating: Manufacturer's standard synthetic materials.
- I. Secondary Backing: Manufacturer's standard material.
- J. Size: 24 by 24 inches (610 by 610 mm).
- K. Applied Treatments:
1. Soil-Resistance Treatment: Manufacturer's standard treatment.
- L. Performance Characteristics:
1. Electrostatic Propensity: Less than 3.0 kV according to AATCC 134.

2.2 CARPET TILE (CPT1)

- A. Basis-of-Design Products: The design is based on the designated products. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers specified. Comparable products are subject to review and approval through the submittal process specified.
1. Color 1: Subject to compliance with requirements, provide J&J Invision; J&J Industries, Inc., Fiction Modular 7025, Anti-Climax 1771.
 2. Color 2 - Accent: Subject to compliance with requirements, provide J&J Invision; J&J Industries, Inc., Index Demi-Plank 7009," Works 1836.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Bentley Prince Street, Inc.
 2. Interface, LLC.
 3. Mannington Mills, Inc.
 4. Milliken & Company.
 5. Mohawk Group (The); Mohawk Carpet, LLC.
 6. Patcraft; a division of Shaw Industries, Inc.

7. Philadelphia Commercial; a division of Shaw Industries, Inc.
 8. Tandus; a Tarkett company.
- C. Construction: Textured patterned loop.
- D. Fiber Type: "Encore BCF."
- E. Face Weight: 19 oz/sq yd (644 g/m²)
- F. Gauge: 1/12 (4.72 rows/cm).
- G. Stitches: 10/in (3.94/cm)
- H. Primary Backing/Backcoating: Manufacturer's standard synthetic materials.
- I. Secondary Backing: Manufacturer's standard material.
- J. Sizes:
1. Color 1: 24 by 24 inches (610 by 610 mm)
 2. Color 2: 12 by 48 inches (305 by 1219 mm).
- K. Applied Treatments:
1. Soil-Resistance Treatment: Manufacturer's standard treatment.
- L. Performance Characteristics:
1. Electrostatic Propensity: Less than 3.0 kV according to AATCC 134.

2.3 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. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), 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. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) 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. Maintain pile-direction patterns indicated on Drawings.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

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SECTION 09 91 23 - INTERIOR PAINTING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
1. Concrete.
 2. Concrete masonry units (CMUs).
 3. Steel and iron.
 4. Galvanized metal.
 5. Gypsum board.
 6. Wood surfaces.

1.3 DEFINITIONS

- A. Gloss Levels: The following gloss designations as determined in accordance with ASTM D 523 apply to paint products specified in this Section:
1. "Flat" refers to a lusterless or matte finish with a gloss range below 5 when measured at a 60-degree meter.
 2. "Eggshell" refers to low-sheen finish with a gloss range between 10 and 20 when measured at a 60-degree meter.
 3. "Satin" refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 4. "Semi-Gloss" refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 5. "Gloss" refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
- B. Areas Subject to Moisture: These spaces are those that have permanent plumbing connections and appliances. These include, but are not limited to, toilet rooms, janitor's closets, locker rooms, shower rooms, training rooms, and laundries.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
1. Indicate VOC content.

- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Test results: Provide detailed records of results of each of the physical and visual tests used in determining the suitability of the existing painted surfaces for overcoating.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.7 QUALITY ASSURANCE

- A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in Painting and Decorating Contractors of America (PDCA) P5. Duplicate finish of approved Samples.
 - 1. Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. Wall Surfaces: Provide samples on at least 100 square feet (9 sq. m).
 - b. Small Areas and Items: Architect will designate an item or area required.
 - 2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
 - 3. Final approval of colors will be from benchmark samples.

1.8 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 (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Benjamin Moore & Co.
 2. Dulux (formerly ICI Paints); a brand of AkzoNobel.
 3. PPG Architectural Coatings.
 4. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
 5. Sherwin-Williams Company (The).
 6. Tnemec, Inc.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
- C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicat-

ed. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

2.3 PAINT COLORS

- A. Basis-of-Design Colors: The design is based on the colors indicated by manufacturer's designations in the Finish Schedule Legend. Subject to compliance with requirements, provide exact duplicates of the named colors.
- B. Colors: Match Architect's samples.

2.4 PAINT MATERIALS

- A. Basis-of-Design Products: The design for each type of paint is based on the products named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.
- B. Primers:
 1. Water-Based Epoxy Block Filler: Tnemec Series 1254, Epoxoblock WB, Color 1202 Off-White.
 2. Polyamine Epoxy Primer: Tnemec Series 201 "Epoxoprime."
 3. Rust Inhibiting Primer for Non-Galvanized Ferrous Metal: Tnemec Series 135 "Chem-build."
 4. Wood Primer: Tnemec Series V10 "Tnemec Primers," Color 1009 Gray.
 5. Latex Based Interior Primer: Sherwin-Williams ProMar 200, "Interior Latex Primer, B28W02600."
- C. Interior Finish Coat Material:
 1. Gloss Acrylic Polymer: Tnemec Series 1028 "Enduratone."
 2. Semi-Gloss Acrylic Polymer: Tnemec Series 1029 "Enduratone."
 3. Gloss Epoxy Finish: Two component, high-performance, modified polyamine epoxy coating: Tnemec, Series 280 "Tneme-Glaze."
 4. Satin Water-Based Epoxy Finish: Tnemec, Series 27WB, Typoxy.
 5. Latex-based Interior Semi-Gloss: Sherwin Williams "ProMar 200 Zero Interior Latex, Series B31-2600."
 6. Latex-based Interior Eggshell: Sherwin Williams "ProMar 200 Zero Interior Latex, Series B20-2600."

2.5 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

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.
 1. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
 2. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 3. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Testing of existing masonry surfaces: Applicator shall evaluate the existing paint systems to determine if surfaces are acceptable for overcoating. Issues to be addressed included, but are not limited to, total film thickness, number of coats, quality of adhesion to the substrate and between coats, and defects in the film.
 1. Perform the following physical tests at a minimum of 3 locations for the corridors and 3 locations in toilet rooms:
 - a. Measure total dry film thickness and number of coats with a Tooke gauge.
 - b. Visually inspect the film for defects such as delamination, cracking and blistering.
 - c. Check adhesion at the same locations where dry film thickness readings were taken, using the following adhesion test methods:
 - 1) "X" Scribe and Tape Test - Conduct this test in accordance with ASTM D 3359 Standard Test Methods for Measuring Adhesion by Tape Test, Method A.
 - 2) Knife Adhesion – Probe at the coating with the point of a knife blade in an attempt to delaminate the coating system between coats or from the substrate.
 2. Document the results of each test.

- C. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
 2. Fiber-Cement Board: 12 percent.
 3. Masonry: 12 percent.
 4. Wood: 15 percent.
 5. Gypsum Board: 12 percent.
- D. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
 2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete and concrete masonry surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

- a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with surface preparation specifications prepared by The Society for Protective Coatings (SSPC).
 - a. Abrasive blast clean steel surfaces as recommended by paint system manufacturer and according to requirements of SSPC-SP 6, Commercial Blast Cleaning.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
 6. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- E. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain paint before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 2. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 3. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 5. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
 - a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
 - b. Brush out and work brush coats into surfaces in an even film.
 - c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
 3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
 - a. Use airless or air-assisted spray equipment with orifice size recommended by manufacturer for material and texture required.
 - b. Apply each coat to provide the equivalent hiding of brush-applied coats.
 - c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.
- C. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer. Finish coats shall be provided in the dry film thickness specified in the schedules located at the end of this Section.
- D. Block Fillers: Apply block fillers to concrete masonry and cast-in-place concrete at a rate to ensure complete coverage with all pores filled.
- E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to substrates that are required to be painted or finished and that have not been prime coated by others.

1. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- F. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
1. Apply additional coats as required to provide a completely opaque and uniform finish surface.
 2. Deep and accent clear-base colors may require 1-2 more coats to achieve the proper hide
- G. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- H. 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 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in Painting and Decorating Contractors of America (PDCA) Specification P1.

3.6 INTERIOR PAINT SCHEDULE

- A. General: Provide the designated paint systems for the various substrates, as indicated in the Room Finish Schedule.
- B. Concrete Masonry Units in Corridors:
 - 1. Water Based Epoxy: Three coats
 - a. Block Filler: Block Filler, for uncoated surfaces only.
 - b. First Coat: Satin Water-Based Epoxy (4-6 mils)
 - c. Second Coat: Satin Water-Based Epoxy (4-6 mils)
- C. Concrete Masonry Units in Areas Subject to Moisture:
 - 1. Gloss Epoxy Coating:
 - a. Block Filler: Block Filler, for uncoated surfaces only.
 - b. First Coat: Gloss Epoxy Finish (6-8 mils)
 - c. Second Coat: Gloss Epoxy Finish (6-8 mils)
- D. Gypsum Board Walls and Partitions (Not Subject to Moisture and Food Preparation):
 - 1. Eggshell Enamel Finish: Three coats
 - a. Primer: Latex-based Interior Primer
 - b. First Coat: Latex-based Interior Eggshell (1.7 mils)
 - c. Second Coat: Latex-based Interior Eggshell (1.7 mils)
- E. Non-Galvanized Ferrous Metal:
 - 1. Acrylic: Three coats
 - a. Primer: Rust Inhibiting Primer (Primer is not required on shop primed items. Shop primer may require field touchup.)
 - b. First Coat: Semi-Gloss Acrylic Polymer (3 mils)
 - c. Second Coat: Semi-Gloss Acrylic Polymer (3 mils)
- F. Painted Woodwork: Provide the following painted finishes for new interior woodwork
 - 1. Acrylic: Three coats
 - a. Primer: Wood Primer (2-3 mils)
 - b. First Coat: Gloss Acrylic Polymer (2-3 mils)
 - c. Second Coat: Gloss Acrylic Polymer (2-3 mils)

END OF SECTION 09 91 23

SECTION 10 21 19 – TOILET COMPARTMENTS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Overhead braced solid plastic toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show locations of floor drains.
- C. Samples for each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: Six hinge(s) with associated fasteners.
 - 2. Latch and Keeper: Three latches and keepers with associated fasteners.
 - 3. Door Bumper: Three door bumpers with associated fasteners.
 - 4. Door Pull: Three door pulls with associated fasteners.
 - 5. Fasteners: Thirty fasteners of each size and type.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. 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: 25 or less.
 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Scranton Products, "Hiny Hiders" or comparable product by one of the following:
1. Accurate Partitions Corp.; ASI Group.
 2. General Partitions Mfg. Corp.
 3. Hadrian Manufacturing Inc.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Floor anchored.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.
1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 2. Heat-Sink Strip: Manufacturer's standard continuous, stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 3. Color and Pattern: Hiny Hiders - Linen (Orange Peel).
- E. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe matching that on the pilaster.
- G. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
 1. Material: Stainless steel.
 2. Hinges: Manufacturer's minimum 0.062-inch- (1.59-mm-) thick stainless-steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
 3. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
 4. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
 5. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
 6. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).
- B. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- C. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at bottoms of posts. Provide shoes at posts to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Urinal Screens: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions.

Attach screens to walls with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact. Level, plumb, and tighten pilasters.

3.3 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 10 21 19

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SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Fire-protection cabinets for portable fire extinguishers.
 - 2. Mounting brackets for fire extinguishers.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Show cabinet door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction and mounting brackets.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINETS

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Larsens Manufacturing Company.
- B. Cabinet Construction: Nonrated and 1-hour fire rated.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- (1.09-mm-) thick cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm) thick fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Cold-rolled steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Recessed Cabinet:
 - 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
- F. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

- G. Cabinet Trim Material: Aluminum sheet.
- H. Door Material: Aluminum sheet.
- I. Door Style: Vertical duo panel with frame.
- J. Door Glazing: Tempered float glass (clear).
- K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide recessed, flush door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- L. Accessories:
 - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - 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.
- M. 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. Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 (ASTM B 221M) for extruded shapes.
 - a. Finish: Clear anodic.
 - 3. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

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.

2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 - 2. Fabricate door frames of one-piece construction with edges flanged.
 - 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets are to be installed.

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

3.2 PREPARATION

- A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. General: Install mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.
- C. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, in compliance with the requirements of NFPA 10.
 - 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
 - 2. Fasten mounting brackets to structure and cabinets, square and plumb.
 - 3. Fasten cabinets to structure, square and plumb.
- D. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
- E. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust cabinet doors to swing and operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 44 00

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SECTION 12 36 16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops, backsplashes, and end splashes.
 - 2. Plastic laminate faced wood apron and fascia fronts.
- B. Related Requirements:
 - 1. Mechanical Drawings for sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops, aprons, and fasciae. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop and apron material, 6 inches (150 mm) square.
 - 2. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches (200 by 250 mm), of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Benchmarks: Benchmark samples shall be prepared to establish full scale, on-site surfaces to serve as standards by which subsequent work may be measured or judged. Each sample shall be prepared using the complete specified products, materials, or systems and installed at the location indicated by the Architect.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS**2.1 SOLID SURFACE COUNTERTOP MATERIALS**

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. E. I. du Pont de Nemours and Company.
 - b. Formica Corporation.
 - c. LG Chemical, Ltd.
 - d. Wilsonart.
 - 2. Type: Provide Standard type unless Special Purpose type is indicated.
 - 3. Colors and Patterns: As selected by Architect from manufacturer's full range.
- B. Plywood and Wood Supports:

1. Plywood: Exposure 1 softwood plywood complying with DOC PS 1, Grade A-B, touch sanded.
2. Wood Supports: Concealed Boards: 15 percent maximum moisture content of the following species and grades:
 - a. Hem-fir or hem-fir (north), Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.

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: Straight, slightly eased at top.
 2. Backsplash: Straight, slightly eased at corner.
 3. End Splash: Matching backsplash.
- C. Countertops: 1/2-inch- (12.7-mm-) thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch- (12.7-mm-) thick, solid surface material.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 1. Fabricate with loose backsplashes for field assembly.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 PLASTIC-LAMINATE-FACED WOOD APRONS AND FASCIAE

- 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. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Wilsonart.
 - 2. Faces: Grade HGS.
 - 3. Exposed Edges: Same as faces.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range in the following categories:
- D. Exposed Panel Edges: Plastic-laminate matching faces.
- E. Adhesives for Bonding Plastic Laminate: Urea formaldehyde.
- F. Assemble panels by gluing and concealed fastening.

2.4 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by material manufacturer.
- B. Sealant for Countertops: Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 786.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
 - c. Tremco Incorporated; Tremsil 200.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- D. Install fasciae and aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- E. 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.

3.3 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. Apply sealant to gaps at walls.

END OF SECTION 12 36 16

SECTION 22 00 00 - PLUMBING**PART 1 - GENERAL****1.1 WORK INCLUDED:**

- A. This Section of the Specification includes the furnishing and installation of complete drainage, water supply, plumbing fixtures and other equipment as described herein and as indicated on the Drawings.

1.2 SUBMITTALS:

- A. Submit complete printed catalog and descriptive data for each major piece of equipment, clearly indicating exactly what features, options and accessories are being provided.
- B. See Section 23 01 00.

1.3 SEWER AND WATER CONNECTIONS:

- A. Connections to on site water, sewer and gas services shall be in accordance with the requirements of the 2012 International Plumbing Code and the respective Utility Company. Pay all associated tap and meter fees and costs.
- B. Before any new sewer work is done, the Contractor shall uncover the sewer line where connection is to be made and shall determine the actual elevation. If the actual elevation of the sewer at the point of connection is such that the new drainage line cannot be installed with the required slope to the new fixtures, the matter shall be referred to the Architect as soon as possible.

PART 2 - PRODUCTS**2.1 DRAINAGE AND VENT PIPING:**

- A. Hub-and-Spigot Pipe: Hub-and-spigot cast-iron pipe not larger than 15-inch size shall be service weight ASTM A74, coated. All changes in pipe size of soil, waste, and drain lines shall be made with reduction fittings or reducers. Changes in direction, where space permits, shall be made with long sweep bends, Y-fittings and 1/8 or 1/16-bends, or combination Y and 1/8-bends. Sanitary tee branches and 1/4-bends may be used for connections of branch lines to fixtures and on vertical runs of pipe. Hub-and-spigot cast-iron pipe larger than 15-inch size shall be Type II or III; Grade C, cast-iron pressure pipe.
 - 1. Gasketed Joints: Molded neoprene elastic compression type gaskets. Gaskets shall conform to ASTM C 564, and pipe, fittings, and gaskets shall bear the symbol of the Cast

Iron Soil Pipe Institute. Pipe and fittings shall be manufactured with the spigot ends plain and beveled, and the bells shall be modified to receive the gaskets. Service weight soil pipe and fittings shall be joined with service weight gaskets. Service weight gaskets shall be clearly designated and identified. A lubricant shall be used in making the joints. When the joint is completed, a tight seal shall be formed between the external face of the pipe and the internal face of the bell. Gaskets shall be capable of making and maintaining a tight seal with a deflection not to exceed 5 degrees. Deflection of pipe will not be allowed to avoid the use of a fitting. Joints shall be assembled by the tools and as recommended by the pipe, fittings, and gasket manufacturers.

- B. "N0-Hub" Cast-Iron Pipe: "No-Hub" cast-iron soil pipe and fittings shall conform to Cast Iron Soil Pipe Institute Specification 301 and ASTM A-888. Pipe, fittings, and couplings shall bear the symbol of the Cast Iron Soil Pipe Institute. "No-Hub" piping systems shall be installed in accordance with the manufacturer's recommendations.
- C. Threaded Steel Pipe: Threaded steel pipe shall be galvanized, Schedule 40 conforming to ASTM A 53.
- D. Threaded Copper Nickel Steel Pipe: Threaded copper nickel steel pipe shall conform to ASTM A 714, Grade V, galvanized.
- E. Threaded Cast Iron Pipe: Threaded cast iron pipe shall comply with ASTM A-74.
 - 1. Fittings on threaded ferrous soil, waste, and drain piping, including storm drainage piping and couplings on pipes 6- inches and smaller, shall comply with ANSI B 16.12. Short tee branches and short turn elbows may, except for wall hung water closets, be used for connections of branch lines to fixture and on vertical runs of pipe; long turn fittings shall be used in all other locations where space permits. Fittings may be galvanized or black, coated or uncoated. Couplings on pipes 8-inches and larger shall be standard weight steel, zinc-coated (galvanized) and need not be recessed; steel couplings shall not be used on piping 6- inches and smaller.
 - 2. Fittings on threaded ferrous vent pipes shall comply with ANSI B 16.3, B16.4, or B 16.12. Couplings shall be as specified above for soil, waste, and drain piping.
- F. Copper Tubing: Copper tubings shall be Type M, in accordance with ASTM B-88, or Type DWV in accordance with ASTM B 306. Ends of tubing shall be cut square and shall be reamed before being made up. Tubing ends shall enter the full depth of the fitting recesses without binding.
 - 1. Fittings for copper tubing shall be solder type, recessed drainage pattern, of wrought copper or cast brass. Recesses shall be smooth and correctly sized to provide proper clearance over the tubing. Solder shall be composition 95/5 tin-antimony or Brigit. Flux shall be noncorrosive. Tubing ends and fitting recesses shall be thoroughly cleaned. Solder shall penetrate fully and shall fill the joint completely.
- G. Plastic Pipe and Fittings: Schedule 40 PVC, ASTM D-1784 with solvent welded joints.
- H. Acid Resistant Piping and Fittings shall be one of the following:

1. Schedule 40 polypropylene, ASTM F1412, ASTM D2447-74, ASTM D4101. Pipe shall be factory and/or field grooved for mechanical joint systems; or field heat-fused using the manufacturer-recommended joining system. Fittings shall meet or exceed schedule 40 dimensions. The joint system shall have a corrosion resistance equal to the pipe and fittings. Piping above grade shall be fire retardant in accordance with ASTM D635
2. Schedule 40 polyvinylidene (PVDF), ASTM F1673, ASTM D3222 and meeting ASTM E84 25/50 for flame spread and smoke development and UL-723 requirements for flame propagation and smoke density in environmental spaces. Pipe shall be factory and/or field grooved for mechanical joint systems; or field heat-fused using the manufacturer-recommended joining system. Fittings shall meet or exceed schedule 40 dimensions. The joint system shall have a corrosion resistance equal to the pipe and fittings.
 - a. Acceptable Manufacturers: GSR Sloan, Labline Enfield, Orion, Zurn.
3. Schedule 40 chlorinated polyvinyl chloride (CPVC) Type IV Grade I compounds with a minimum cell classification of 23447. Pipe and Fittings shall conform to ASTM F 2618. One-Step solvent cement shall be specially formulated for chemical waste applications and conform to ASTM F493. All pipe, fittings and cement shall be supplied as a system by a single manufacturer and shall be certified by NSF International for use in corrosive waste drainage systems and shall bear the mark "NSF-cw". Flame spread rating not over 25 and a smoke developed rating not higher than 50 per ULC S102.2.
 - a. Acceptable Manufacturers: Charlotte Pipe "ChemDrain", Spears.

2.2 UNDERGROUND WATER PIPING:

- A. Underground domestic water piping beyond five feet outside the building shall be as specified by the Civil Engineer.
- B. Underground water piping beneath the building to a point five feet outside the building shall be one of the following:
 1. Cross-linked polyethylene (PEX).
 - a. Material Standard: Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third party agency.
 - 1) Standard grade hydrostatic design and pressure ratings from Plastic Pipe Institute.
 - 2) Minimum Bend Radius (cold bending): No less than 6 times the outside diameter. Use a bend support as supplied by the PEX tubing manufacturer for tubing with a bend radius less than stated.
 - 3) Nominal Inside Diameter: Provide tubing with nominal inside diameter, in accordance with ASTM F876.
 - b. Fittings:
 - 1) Joints below grade shall be avoided if possible.

- 2) Fittings shall be of a type approved by the piping manufacturer for the application, and shall be supplied by piping manufacturer.
 - 3) Material: Fittings shall be suitable for direct burial in earth, and shall be manufactured from one of the following –
 - 4) Same material as piping.
 - 5) Polyalloy (ASTM 2359).
 - 6) Bronze (w/ stainless steel sleeve) (ASTM 877).
 - 7) Dezincified brass (ASTM 1807).
 - 8) Material Standard: Comply with ASTM F1960.
- c. Accessories
- 1) Bend supports designed for maintaining tight radius bends shall be supplied by the PEX tubing manufacturer.
 - 2) Tools required to install the piping fittings shall be supplied by the PEX tubing manufacturer.
 - 3) The tubing manufacturer will provide clips and/or PEX rails for supporting tubing runs.
- d. Warranty:
- 1) Warranty Period for PEX piping and fitting system shall be 25-year, non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion.
- e. Acceptable Manufacturers – Mr. Pex, Uponor, Viega.
2. Copper tubing, Type K, soft drawn, ASTM B-88.
- a. Joints below grade shall be avoided if possible.
 - b. Where necessary, joints below grade shall utilize fittings of the recessed solder-joint type of either wrought copper or cast brass. Solder shall be silver solder having a melting point of not less than 1120°F. Adapters for connection to threaded valves, fittings, meters and other equipment shall be cast brass. Recesses shall be smooth and correctly sized to provide proper clearance over the tubing.

2.3 ABOVEGROUND WATER PIPING:

- A. Aboveground domestic water piping 3-inches in size and smaller, shall be copper tubing, Type L, hard drawn, ASTM B-88. Fittings shall be one of the following:
1. Recessed solder- joint type of either wrought copper or cast brass. Adapters for connection to threaded valves, fittings, meters and other equipment shall be cast brass. Recesses shall be smooth and correctly sized to provide proper clearance over the tubing. Solder shall be composition 95/5 tin-antimony or Brigit. Flux shall be noncorrosive. The solder shall contain no lead.
 2. Mechanical grooved joint pipe couplings may be used for connecting equipment to the piping system, headers, and distribution piping in lieu of soldered tube or fitting

connections for water piping with NSF-61 rated temperatures to +180°F. System shall meet the low lead requirements of NSF-372.

- a. Coupling housing clamps shall consist of two ductile iron castings complying with ASTM A-536, cast with offsetting angle-pattern bolt pads. Housing clamps shall hold in place an elastomer water sealing gasket of a FlushSeal® pressure responsive design. Clamps and gaskets shall be manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.)
 - 1) Victaulic Style 607H 'Quick-Vic' installation ready coupling, for direct stab installation without field disassembly.
 - b. Fittings shall be manufactured to copper-tube dimensions, ASME B16.22 or ASME B16.18 Victaulic Copper-Connection.
 - c. Flange Adapter: Flat face, ductile iron housings with elastomer pressure responsive gasket, for direct connection to ANSI Class 125 or 150 flanged components. For use with copper-tube dimensioned grooved ends. Victaulic Style 641.
 3. Victaulic Installation-Ready™ fittings for grooved end copper tubing shall be manufactured to copper-tube dimensions. Fittings shall be ductile iron conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, complete with PVDF (Poly Vinylidene Fluoride) and Grade "EHP" EPDM-HP [Grade 'T' Nitrile] gasket; and ASTM A449 electroplated steel bolts and nuts. System shall be rated to 300 psi (2065 kPa) with Type K or L Copper Tubing.
 4. Viega ProPress Fitting: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press end shall have SC (Smart Connect) feature design (leakage path). Smart Connect™ (SC Feature) In ProPress ½" to 4" dimensions the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection (when testing from ½ to 85 psi). The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
- B. At contractor's option, branch piping serving toilet rooms and downstream of toilet room isolation valves, and piping serving individual fixtures may be PEX piping as specified for underground water piping.

2.4 UNDERGROUND SOIL, WASTE, VENT AND DRAIN PIPING:

- A. Underground soil, waste, vent and storm drainage piping shall be as follows (unless otherwise indicated on Drawings):
 1. Underground sanitary and storm drain lines shall be hub- and-spigot cast-iron, or plastic pipe.
 2. Underground acid waste and vent piping shall be either of the following:
 - a. Schedule 40 polypropylene with mechanical or heat-fused joints.

- b. Schedule 40 chlorinated polyvinyl chloride (CPVC) with solvent cement joints.

2.5 ABOVEGROUND SOIL, WASTE, VENT AND DRAIN PIPING (includes condensate drain piping):

- A. Aboveground soil, waste, vent and storm drainage piping:
1. Where exposed in rooms or where located in return air plenums, piping may be hub- and-spigot cast iron, or "No-Hub" cast iron, threaded galvanized steel, threaded copper nickel steel, threaded cast iron, copper tubing, or CPVC pipe. **PVC piping shall not be used where exposed or located in return air plenums.**
 2. Where installed inside walls or above ceilings that are not return air plenums, piping may be hub- and-spigot cast iron, or "No-Hub" cast iron, threaded galvanized steel, threaded copper nickel steel, threaded cast iron, copper tubing, PVC or CPVC pipe.
 3. Exposed waste piping and fittings in toilet rooms, and in finished areas, shall be chromium plated brass. Pipe shall be red brass, standard weight, iron pipe size and thickness, ASTM B-43, and fittings shall be threaded cast-brass of the recessed drainage pattern. Chromium plated piping shall be carefully measured and cut so that no more than one full turn of thread shall be exposed beyond any fittings. Joints between brass and ferrous pipes shall be threaded.
 4. Aboveground acid waste and vent piping shall be schedule 40 polyvinylidene (PVDF). Polypropylene piping shall not be installed above ground.

2.6 TRAPS:

- A. Provide deep seal traps on all floor drains.

2.7 CLEANOUTS AND FERRULES:

- A. Cleanouts shall be installed as shown on Drawings and where required by the building code.
- B. Cleanout plugs for threaded fittings shall be in accordance with Table 52 of CS 188. Except for test openings, where size must be sufficient to admit test plug, bushings will be permitted on pipes 5-inches and larger to reduce plug size to 4-inches; cleanout plugs for piping 4-inches and smaller shall be the same size as the pipe.
- C. Cleanout plugs for hub-and-spigot fittings shall be screwed into ferrules caulked into the fitting. Ferrules and plugs shall be in accordance with Table 54 of CS 188.
- D. Cleanout plugs on copper drainage lines shall be installed in solder-joint fittings having threaded openings provided for the cleanout, or in solder-joint fittings with threaded adapters.
- E. Acceptable Manufacturer - Josam, Smith, Zurn, Wade.

2.8 FLASHING:

- A. Openings in roof for waste vent pipes shall be provided with flexible rubber boots clamped to vent pipe and flashed into roofing. Products and installation shall be watertight and shall be approved by the National Roofing Contractor's Association.

2.9 DIELECTRIC ISOLATORS:

- A. Provide a dielectric isolator at all points of connection between ferrous and nonferrous piping. Isolators shall be made of Teflon or nylon made up in the form of screwed type unions or insulating gaskets and bolt sleeves and washers for standard flanged connection.
- B. Connections may be made with Schedule 80 CPVC nipples, nylon or Teflon bushings selected for the temperatures and pressures of the system.

2.10 VALVES:

- A. All valves shall be designed for 125 psi minimum water working pressure, but in no case less than 150% of the system operating pressure, whichever is greater.
- B. Provide valves with extended necks in insulated piping.
- C. All valves installed in potable systems shall be lead-free in accordance with Federal Government S.3874.
- D. Ball Valves:
 - 1. For size 4- inch and smaller shall be 2 piece, full port brass ball valves with RPTFE seats and packing, blow out proof stem, and sweated or threaded ends.
 - a. Equivalent to Apollo 77FLF.
- E. Check Valves:
 - 1. Check valves 2-inch in size and smaller shall be soldered bronze body, horizontal swing check type with regrindable seat and Buna-N disc.
 - a. Equivalent to Nibco S-413.
 - 2. Check valves 2 1/2-inch in size and larger shall be flanged, cast iron, spring actuated, , horizontal swing check type with stainless steel spring, aluminum bronze bushing, Buna-N bonded to bronze seat, and bronze disc.
 - a. Equivalent to Nibco F-910-B-LF.
- F. Butterfly Valves:
 - 1. 2 through 6-inch, 300 psi (2065 kPa) maximum pressure rating, with copper tubing sized grooved ends. Cast brass body to UNS C87850. Aluminum bronze disc to UNS C95500, with pressure responsive elastomer seat. Stem shall be offset from the disc centerline to

provide complete 360-degree circumferential seating. Certified to the low lead requirements of NSF-372. Victaulic Series 608N.

G. Acceptable Manufacturers – Apollo, DeZurik, Milwaukee, Nibco, Victaulic, Watts.

H. Automatic Balancing Valves:

1. Automatic flow control valves shall be factory set to a rated flow, and shall automatically control the flow to within $\pm 10\%$ of the rated value over a 40 to 1 differential pressure, operating range, (2 to 80 psid). Valves shall have the capabilities and pressure ratings as indicated and conform to this specification.
2. Automatic balance assembly shall include one or more precision sculptured brass or polyphenylsulfone orifices with an elastomeric diaphragm. Each automatic balancing valve shall automatically control the flow rate to within $\pm 10\%$ of its rated flow, over a temperature range of 32 to 225°F, and a pressure differential range of 2 to 80 psid.
3. Inline copper sweat valves 1/2, 3/4, 1, & 1 1/4 inch shall consist of a wrought copper (ASTM B88-83a) housing. Valve bodies shall be suitable for 522 psig working pressure rating per ASME B31.9 Building Services Piping. Flow rates from 0.5 to 25 gpm shall have a differential pressure operating range of 2 to 80 psid.
4. Equivalent to Hays Model 2511, or Victaulic ICSS TA Series 76X.

2.11 WALL HYDRANTS:

- A. Wall hydrants shall be cast bronze, chrome plated nonfreeze type with 3/4-inch inlet and 1-inch copper casing of sufficient length to extend through walls as required to place valve inside the building. Valve rod and seat washer shall be removable through the face of the hydrant. Hydrants shall be furnished complete with adjustment locknuts, union elbows, detachable T-handles, and integral vacuum breaker.
- B. Acceptable Manufacturers - Josam, MiFab, Prier, Smith, Wade, Watts, Woodford, Zurn.

2.12 GAS PIPING:

- A. Underground distribution piping shall be polyethylene piping conforming to applicable State and Federal Standards. The installation shall be completed by personnel meeting the requirements of applicable State and Federal Standards. Risers to above grade shall be anodeless. Joints shall be fusion butt welded. Provide tracer wire.
- B. Aboveground distribution piping 2-inches and smaller shall be Schedule 40 black steel using malleable iron threaded fittings, wrought steel butt welding fittings or pressed fittings.
1. Pressed fittings shall be Viega MegaPress Gas Press Fittings. MegaPress Fittings: 1/2-inch through 2-inch shall conform to ASME B31.1, ASME B31.3, or ASME B31.9 MegaPress fittings with zinc and nickel coating for use with IPS carbon steel pipe conforming to ASTM A53, ASTM A106, ASTM A135, or ASTM A795. MegaPress fittings shall have an HNBR sealing element, 420 stainless steel grip ring, separator ring, and an un-pressed fitting leak identification feature. Sealing elements shall be verified

for the intended use. Installation must be in accordance to manufacturer's instructions and specifications.

- C. Aboveground distribution piping 2 1/2-inches and larger, and concealed piping of any size shall be Schedule 40 black steel with wrought steel butt welding fittings, or pressed fittings as specified above.
- D. Valves:
 - 1. For sizes 1-inch and smaller, provide ball valves, 125 psig WOG.
 - 2. For sizes larger than 1-inch, provide gas cocks, 125 psi WOG, bronze straight way cocks, flat or square head, threaded ends for 2-inches and smaller, flanged ends for 2 1/2-inches and larger.

2.13 GAS PRESSURE REGULATORS:

- A. Regulators shall be single stage, steel jacketed, corrosion resistant, with vent line extended to atmosphere, threaded ends for 2-inches and smaller, flanged ends for 2 1/2-inches and larger.
- B. Acceptable Manufacturers - Fischer, Maxitrol.

2.14 FIXTURE SUPPLY PIPING SUPPORTS:

- A. Support and position fixture rough-in piping in plumbing chases, shafts, fixture walls or batteries, at each fixture with metal strut framing system or angle iron supports and U- bolt clamps or high impact polystyrene or ABS anchoring channels designed for the purpose. Anchors shall effect positive electrolytic isolation, noise dampening, solid support, and rough-in positioning. See Section 23 20 00 for additional requirements.
- B. Acceptable Manufacturers - Sumner, Pipefix, Channel.

2.15 BACK-TO-BACK FIXTURE MANIFOLD:

- A. Wherever fixtures utilizing both hot and cold water are installed back-to-back on a partition, the hot water shall be on the left and the cold water shall be on the right on both sides of the partition. Cast bronze manifold fittings designed for the purpose, and to offset around stack may be used.
- B. Acceptable Manufacturers - Precision Plumbing Products "BAC 2 BAC", or approved equal.

2.16 SHOCK ABSORBER:

- A. Shock absorbers shall be factory fabricated stainless steel casing and bellows with working pressure of 250 psi, bellows precharged with nitrogen. Construction shall be in accordance with Plumbing and Drainage Institute Standard PDI-WH201, ANSI A-11, 2.26.1, and ASSE 1010.

- B. Acceptable Manufacturers - Josam, MiFab, Smith, Wade, Watts, Zurn.

2.17 PLUMBING FIXTURES, GENERAL:

- A. Provide plumbing fixtures scheduled, at locations and mounting heights indicated on architectural drawings.
- B. Provide fixture, trim and equipment specified or of similar quality, design, capacity, appearance and function by acceptable manufacturer listed.
- C. Provide required trim for each fixture including faucets, stops, drains, tail pieces, traps and escutcheons.
- D. Fixtures fitted to walls shall have backs ground square and true. Caulk juncture of fixture with wall or floor as directed by the Architect.
- E. Exposed Pipe - Exposed flush, waste and supply pipes at fixtures shall be chromium plated brass pipe, iron pipe size.
- F. Vandalproofing - Provide vandalproof fittings for all fixtures.
- G. Acceptable Manufacturers -
1. Fixtures - American Standard, Crane, Gerber, Kohler, Sloan, Toto, Zurn.
 2. Stainless Steel Sinks (self-rimming) - Elkay, Just, Kohler, Kindred.
 3. Faucets and Drains - American Standard, Bradley, Chicago, Delta, Eljer, Elkay, Gerber, Kohler, Powers, Sloan, Speakman, Symmons, Zurn.
 4. Supplies, Stops and Traps - Central, Crane, Dearborn, Eljer, McGuire.
 5. Closet Seats - Church, Beneke, Olsonite, Sperzel.
 6. Carriers - Josam, MiFab, Smith, Wade, Watts, Zurn.
 7. Service Sinks - Florestone, Fiat, Stern-Williams.
 8. Floor Drains - Josam, MiFab, Smith, Wade, Watts, Zurn.
 9. Eye Wash, Emergency Showers - Bradley, Haws, Guardian, Speakman.

2.18 PIPE HANGERS AND SUPPORTS:

- A. See Section 23 01 00.

2.19 WATER HEATER - POWER DIRECT-VENT, GAS FIRED, STORAGE TYPE:

- A. Provide AGA approved storage water heater as scheduled, with welded steel tank, polyurethane closed cell insulation, protective sheet metal jacket with baked enamel finish, fully submerged glass-lined condensing heat exchanger, controls, non-sacrificial powered anode rod(s) and temperature and pressure relief valve. Provide water heater with ASME rating when scheduled and for all models with an input rating of 200,000 BTUH or greater.

- B. The heater shall be suitable for sealed combustion direct vertical or sidewall venting using PVC air intake and exhaust pipe for a total of 120 equivalent feet of intake pipe, and 120 equivalent feet of vent pipe.
- C. The tank shall be fully glass or phenolic epoxy plastic lined after assembly and welding of tank. The tank shall be approved for a working pressure of 160 psi minimum. A hand hole cleanout and a drain valve shall be located near the bottom of the tank. The tank assembly shall be covered by a three year limited warranty against failure due to corrosion, metal fatigue or overheating caused by the buildup of scale, film or sediment.
- D. The heat exchanger shall be fully submerged, condensing, spiral shaped, and glass-lined on both water and vent sides to protect against corrosive flue gasses and condensate inside the coil.
- E. The heater shall operate at a minimum of 96% thermal efficiency when tested to ANSI Z21.10.3 "Gas Water Heaters". The heaters standby losses shall satisfy ASHRAE 90.1 standards.
- F. A microprocessor shall control all heater functions including ignition and temperature regulation. Precise temperature control shall be adjustable from 90 to 180 degrees F. A LCD display shall provide detailed operational and diagnostic information in plain English.
- G. The heater shall be completely packaged, requiring only field connection for gas, electrical power, plumbing, and combustion air intake and venting. Provide a thermal expansion tank for the hot water system. Additionally, provide all accessories required to complete water heater installation as scheduled, as indicated on Drawings and as recommended by equipment manufacturer.
- H. Provide a thermometer at the outlet of each water heater.
- I. Acceptable Manufacturers - A.O. Smith, Lochinvar, PVI, State.

2.20 TEMPERATURE AND PRESSURE RELIEF VALVES:

- A. Provide combination temperature and pressure relief valves on each domestic water heater and fired pressure vessel. Valves shall be constructed and rated in accordance with ASME standards, with cast iron bodies, shall be of the diaphragm type, with stainless steel spring, field adjustable, set to relieve above the operating pressure or temperature, but lower than the design pressure of the vessel. Pipe blowoff line full size to 6" above finished floor.
- B. Acceptable Manufacturers - Amtrol, Bell & Gossett, Taco, Watts.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION:

- A. Do not route piping above electrical distribution equipment, per National Electric Code.

3.2 SOIL, WASTE AND VENT SYSTEMS:

- A. Pitch lines at 1/8-inch per foot minimum and 1/4-inch per foot where possible.
- B. Below Grade - Install immediately after excavation, lay pipe so that entire length bears on firm soil, excavate for hubs, do not backfill until installation has been observed.
- C. Above Grade - Install in structure as high as possible. Independently support each length of cast iron. Support steel pipe according to hanger schedule. Support vertical lines at each floor, both horizontally and laterally.
- D. Joints and Fittings for CPVC and PVC plastic piping shall be prepared and solvent welded according to manufacturer's recommendations.
- E. Joints and Fittings for acid waste piping shall be installed according to manufacturer's recommendations.
- F. Vents - Slope up to high point. Support each length of vent pipe independently within structure.
- G. Sanitary Waste Cleanouts - Install cleanouts where required by code and as shown on Drawings. Set floor cleanout covers flush with adjacent finished surface.
- H. Floor Drains, Waste Receptors - Install as shown and connect to cast-iron, deep seal "P" trap. Where a water proof membrane is used, anchor membrane to flange with clamping collar and rustproof bolts.
- I. Drain Lines - Install drain lines from air conditioning equipment, tanks and other items of equipment requiring regular drainage, to waste receptors. Terminate above receptors with elbow turned down when piping is run horizontal to receptor.
- J. Plumbing Fixtures - Rough-in and install plumbing fixtures at height as recommended by the manufacturer unless otherwise indicated on architectural drawings. Caulk perimeter of wall or floor mounted fixture where it meets wall or floor. caulking shall be of type and color as selected by Architect.

3.3 STORM WATER SYSTEMS:

- A. Pitch lines at 1/8-inch per foot minimum and 1/4-inch per foot where possible.
- B. Below Grade - Install immediately after excavation, lay pipe so that entire length bears on firm soil, excavate for hubs, do not backfill until installation has been observed.
- C. Above Grade - Install in structure as high as possible. Independently support each length of cast iron. Support steel pipe according to hanger schedule. Support vertical lines at each floor, both horizontally and laterally.
- D. Drains-
 - 1. Set roof drains, and other storm related drains.

2. Connect to piping systems - use rigid connections.
 3. Install roof drains with lead flashing and set covers flush with adjacent finished surface.
- E. Storm Cleanouts - Install where indicated on Drawings and where required by code.

3.4 DOMESTIC WATER SYSTEMS:

- A. Below Grade - Install immediately after excavation, do not backfill until installation has been observed, and lay pipe so that entire length bears of firm soil.
1. Site Verification of Conditions:
 - a. Verify that site conditions are acceptable for installation of the PEX potable water system.
 2. PEX Piping Installation:
 - a. Do not proceed with installation of the PEX potable water system until unacceptable conditions are corrected.
 - b. Install PEX tubing in accordance with the tubing manufacturer's recommendations and as indicated in the 2006 Plastic Pipe Institute/Plastic Pipe and Fitting Association/NAHB/PATH Design Guide.
 - c. Joints below grade shall be limited to those required for tees and connection to valves at connections to buildings.
 - d. Minimum horizontal supports are to be installed not less than 32 inches between hangers in accordance with model plumbing codes and the installation handbook.
 - e. Do not expose PEX tubing to direct sunlight for more than 30 days.
 - f. Ensure no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tubing manufacturer.
 - g. Protect PEX tubing with sleeves where abrasion may occur.
 - h. Use tubing manufacturer supplied bend supports where bends are less than six times the outside pipe diameter.
 - i. Pressurize tubing with air in accordance with applicable codes or in the absence of applicable codes to a pressure of 25 psi (173 kPa) above normal working pressure of the system.
 - j. Comply with safety precautions when pressure testing, including use of compressed air, where applicable. Do not use water to pressurize the system if ambient air temperature has the possibility of dropping below 32 degrees F (0 degrees C).
 - k. Field Quality Control:
 - 1) Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and one site visit for inspection of product installation in accordance with manufacturer's instructions.
- B. Above Grade - Run level as high as possible in building structure, install hangers per schedule, allow for expansion and contraction, and anchor where required. Separate hot and cold pipes, with 6-inch minimum clear space between piping. Install 3/4-inch hose end drain valve at low points. Install ball valve at each plumbing fixture or group of fixtures, and at each point of

connection to equipment. Allow access to equipment, for removal and servicing of pumps or equipment without draining system.

1. PEX Piping Installation:

- a. Install PEX tubing in accordance with the tubing manufacturer's recommendations and as indicated in the 2006 Plastic Pipe Institute/Plastic Pipe and Fitting Association/NAHB/PATH Design Guide.
- b. Exposed PEX piping shall be neatly installed plumb and parallel to building surfaces, and supported to eliminate sags and deflections.

2. Copper Piping Installation:

- a. For slabs on grade, copper pipe shall be separated from sand fill beneath poured concrete by a minimum of 6 inches of soil backfill.
- b. Isolate copper pipe from concrete at all locations where piping penetrates concrete or masonry construction.

C. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).)

D. Viega ProPress connections: Copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. Pipe shall be approved by manufacturer for use with fittings. Piping shall be square cut, properly deburred, and cleaned. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

E. Connections to equipment:

1. Connect to each plumbing fixture.
2. Connect to each hydrant.
3. Provide valved connections to each piece of kitchen equipment or owner-provided equipment requiring water connection. Provide pressure regulators, pressure reducing valves, vacuum breakers, shock arrestors and other accessories as required for equipment supplied.
4. Provide unions or flanged connections at each piece of equipment connected.
5. Install supply connections to fixtures through wall as high under fixtures as possible.

3.5 WATER HEATER INSPECTION CERTIFICATE:

- A. When required by the Kansas Boiler Safety Act for the storage capacity and/or firing rate of the installed water heater, the Contractor shall be responsible for obtaining an inspection and acceptance certificate from the State Boiler Inspector. The Contractor shall schedule and pay for the inspection, and shall post the certificate(s) in the room containing the water heater.

3.6 SHOCK ABSORBERS:

- A. Install in accessible locations, see drawings. Provide access panels where required.

3.7 DISINFECTION OF WATER SYSTEMS:

- A. General - Disinfect all domestic water systems. Disinfection shall not start until water systems are complete, connections made, and system is flushed out. Upon completion of disinfection, submit certificate and certified bacteriological test report for approval.
- B. Follow the method prescribed by the local Health Department, Building Code Department or water purveyor. In the absence of a prescribed method, follow the procedure outlined in either AWWA C651 or AWWA C652.

3.8 FUME HOODS:

- A. Field verify points of connection and routing to connection locations.
- B. Coordinate exact piping and connection requirements with fume hoods.
- C. Verify that all valves, neutralizing traps and other plumbing items that require service will be accessible after complete installation.

3.9 GAS PIPING SYSTEM:

- A. Above Grade - Run level and as high as possible. Install hangers per schedule. Allow for expansion and contraction. Anchor where required. Install Schedule 10 carbon steel welded gas tight pipe casing around piping in concealed vented areas. Pipe casings to be vented to atmosphere. Pipe casings not required in exposed areas.
- B. Below Grade - Installation shall meet the requirements of applicable State and Federal Standards.
- C. Above Roof - Support piping at no more than 8 feet on center, with manufactured pipe supports: Miro Industries Model 3-R or approved equivalent. The pipe supports shall be a roller-bearing type designed to support piping or conduit, and to absorb thermal expansion and contraction of piping or conduit thus preventing damage to roof membrane. The pipe or conduit shall rest on a polycarbonate resin roller and a glass-filled nylon rod situated in a polycarbonate resin seat.
- D. Connections to equipment - Connect at each appliance or gas using device and provide gas cock unions, and dirt leg.

3.10 TESTING:

- A. Systems shall be tested in accordance with the 2012 International Plumbing Code prior to insulating, covering or concealing this work.
- B. Plug or cap lines for testing and disconnect equipment and devices which may be damaged by excessive test pressures.
- C. Before final connections are made to site sewer and connection of fixtures, all underground drainage piping shall be hydrostatically tested. All openings shall be capped or plugged and the system filled with water to the top of a vertical section of pipe 10 feet high, temporarily connected to the highest point of the underground system. The water shall be allowed to stand in the system for at least 30 minutes prior to inspection. If the water level remains constant and no leaks are found during the period of inspection, the water shall be drained from the system. Final connections shall then be made to the site sewer and the trenches backfilled.
- D. Before any fixtures are connected, all sanitary drain and vent systems, and storm drainage systems above ground, shall be hydrostatically tested. All opening shall be capped or plugged and the systems filled with water. The water shall be allowed to stand in the systems for at least 30 minutes prior to inspection. If the water level remains constant and no leaks are found during the period of inspection, the water shall be drawn off and fixtures, etc., connected. No parts of a system shall be tested with less than 10-foot head of water. No parts of a system using cast iron bell-and-spigot pipe shall be tested with more than a 40-foot head of water, and no parts of a system using screwed piping shall be tested with more than 200-foot head of water. The Contractor shall be responsible for determining the amount of piping he wishes to test at one time, but the above conditions shall not be exceeded.
- E. Before final connections are made to a water supply system, all underground water piping shall be hydrostatically tested and proven tight at a pressure of not less than 100 psi or 50 psi in excess of the working pressure, whichever is greater, at the lowest point in the system. The pressure shall be maintained for at least 1 hour for inspection, the water shall be drained from the system. Final connections shall then be made to the water supply system, and the trenches backfilled.
- F. Before any fixtures or equipment are connected, all domestic water and compressed air systems connected thereto above ground shall be hydrostatically tested and proven tight at a pressure of not less than 100 psi or 50 psi in excess of the working pressure, whichever is greater, at the lowest point in the system. The pressure shall be maintained for at least 2 hours for inspection. If the pressure remains constant and no leaks are found during the period of inspection, the water shall be drained from the systems and final connections shall then be made to the fixtures, etc.
- G. All tests shall be made when there is no danger of freezing, prior to enclosure of any parts of the systems by furrings, suspended ceilings, etc.
- H. Test to demonstrate the capacities and general operating characteristics of all equipment, such as water heating outfits, pumps, water coolers, etc., shall be made under the direction of the Architect at the time of final inspection and under conditions imposed by him. Water heaters having steam or water coils shall be tested with the main heating system in operation.

- I. Gas piping shall be tested in accordance with the requirements of the local building code and the 2012 International Fuel Gas Code.
- J. All tests shall be made in the presence of and results approved by the Architect.
- K. Should any leaks, flaws, or defective materials or equipment be found during the testing operations, such leaks or flaws shall be corrected, and defective materials and equipment replaced. All defective joints shall be remade, and calking or threaded joints will not be acceptable. After corrections have been made, tests shall be repeated until all systems are proven tight and satisfactory. All corrections and retests shall be made at Contractor's expense.

3.11 CLEANING:

- A. See Section 23 01 00.

3.12 COMPLETION:

- A. Complete each piping system in its entirety. Properly support the system, clean the interior surfaces of the pipe by flushing, and disinfecting domestic water piping as specified. Leave systems filled and free from air, and ready for operation and testing.

END OF SECTION 22 00 00

SECTION 23 01 00 - BASIC MECHANICAL REQUIREMENTS**PART 1 - GENERAL****1.1 GENERAL REQUIREMENTS:**

- A. Work covered by this section of these specifications will be accomplished in accordance with the respective drawings, information, or instructions to bidders, general requirements, and the supplementary and general conditions of these specifications. Supplementary conditions, special conditions, addenda, or directive which may be issued by the Engineer shall be complied with.
- B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contracts, sub-contracts, or trades as may be issued for bidding purposes only. The contract documents are combined Architectural, Structural, Plumbing, Heating, Ventilating, and Air Conditioning and Electrical Drawings and Specifications. Drawings and Specifications are on file in the Engineer's office and each Bidder shall thoroughly acquaint himself with the details of the complete set of drawings and specifications before submitting his bid. Drawings and specifications form a part of the contract documents for each separate contract and shall be considered as bound therewith in the event partial sets of plans and specifications are issued for bidding only. The submission of bids shall be deemed evidence of the review and examination of drawings, specifications, and addenda issued for this project as no allowance will be made because of the Contractor's unfamiliarity with any portion of the complete set of documents.
- C. Connect new work to existing work in neat and approved manner. Restore existing work disturbed to original condition.
- D. Existing remaining systems shall be left in perfect working order upon completion of all new work.
- E. Any equipment which is removed and not reinstalled shall be delivered on site to the Owner, or removed by the Contractor, as directed by the Owner.

1.2 MECHANICAL CONTRACTOR QUALIFICATIONS:

- A. Mechanical Contractor (as a company) and his job superintendent for their portion of the work shall have at least three years of satisfactory experience in completion of projects of comparable size and complexity. Evidence of this experience will be required before approval of the Engineer as being acceptable for their portion of the work.

1.3 SCHEDULE:

- A. The schedule and sequence of work must be carefully coordinated with the Owner, to ensure that all work performed within the existing buildings will result in a minimal amount of noise, dust and disruption to the activities in the existing buildings.

- B. All interruptions of existing services must be coordinated with the Owner, to minimize inconvenience and disruption to the activities in the existing buildings. All interrupted services shall be restored as quickly as possible. All interrupted systems shall be thoroughly cleaned and tested prior to being placed back into operation.

1.4 SCOPE:

- A. The work included under this specification consists of the furnishing of all labor, materials, tools, transportation, services, etc., which are applicable and necessary to complete the installation of the systems specified in these specifications, as illustrated on the accompanying drawings, or as directed by the Engineer.
- B. In general, the various lines and ducts to be installed by the various trades under this specification shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards so as to complete the work in a neat, quiet, and satisfactorily workable manner. Run work parallel or perpendicular to the lines of the building unless otherwise noted.
- C. The construction details of the building are illustrated on the Drawings. Each Contractor shall thoroughly acquaint himself with the details before submitting his bid as no allowance will be made because of the Contractor's unfamiliarity with these details. Place inserts to accommodate the ultimate installation of the pipe hangers in the forms before construction. Concealed lines shall be installed as required by the pace of the general construction to precede that general construction.

1.5 INSPECTION OF SITE:

- A. Contractor shall visit the site, verify existing items shown on plans or specified, and familiarize himself with the working conditions, hazards, existing grades, actual formations, soil conditions, and local requirements involved, and submission of bids shall be deemed evidence of such visit. Proposals shall take these existing conditions into consideration and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility.

1.6 UTILITIES, LOCATIONS AND ELEVATIONS:

- A. Locations and elevations of the various utilities included within the scope of this work have been obtained from Record Drawings and other substantially reliable sources and are offered separately from the Contract Documents as a general guide only, without guarantee as to accuracy. Contractor shall examine the site, availability of utilities as to their relation to the work; the submission of bids shall be deemed evidence thereof.

1.7 CODES AND STANDARDS:

- A. Workmanship, material and equipment shall be in accordance with Specifications and drawings and in some instances the requirements exceed those required by codes and standards. Where not exceeded, the codes and standards shall be considered as absolute minimum requirements.

1.8 MATERIALS AND WORKMANSHIP:

- A. Materials unless otherwise specified shall be new, free from any defects, and of the best quality of the respective kinds. Like materials used shall be of the same manufacture, model, and quality unless otherwise specified.
- B. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, adjusted, and conditioned as recommended by the manufacturers, or as indicated in their published literature, unless specifically herein specified to the contrary.
- C. Work under this contract shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials, and the temporary plugging of open lines during construction. At completion, the installation shall be thoroughly cleaned and tools, equipment, obstructions, or debris present as a result of this contract shall be removed from the premises.

1.9 COOPERATION:

- A. Work under these specifications shall be accomplished in conjunction with other trades on this project in a manner which will allow each trade adequate time at the proper stage of construction to fulfill his work.
- B. Maintaining contact and being familiar with the progress of the general construction and timely installation shall be the responsibility of this trade to expedite this contract and avoid unnecessary delays in the progress of other trades.
- C. Should any question arise between trades as to the placing of lines, ducts, conduits, fixtures, or equipment, or should it appear desirable to remove any general construction which would affect the appearance or strength of the structure, reference shall be made to the Engineer for instructions.

1.10 DRAWINGS AND SPECIFICATIONS:

- A. The drawings show diagrammatically the locations of the various lines, ducts, conduits, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building, and in cooperation with other trades and, in all cases, shall be subject to the approval of the Engineer. The Engineer reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.
- B. Should any deviations from the contract documents be deemed necessary by the Contractor, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Engineer for approval.

- C. Exceptions and inconsistencies in plans and specifications shall be brought to the Engineer's attention before bids are submitted; otherwise, the Contractor shall be responsible for the cost of any changes and additions that may be necessary to accommodate his particular apparatus.
- D. Contractor shall lay out his work maintaining lines, grades, and dimensions according to these drawings with due consideration for other trades and verify dimensions at the site prior to any fabrication or installation; and should any conflict develop or installation be impractical, the Engineer shall be notified before any installation or fabrication and the existing conditions shall be investigated and proper changes effected without any additional cost.
- E. Manufactured equipment shown, arrangement of parts, openings in floors, roof or walls are sized for a particular manufacturer's equipment. The Contractor shall verify exact sizes and arrangements required by equipment and in submitting his equipment for approval he certifies that the equipment will fit within the space allotted for it.
- F. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of materials or work. The Engineer does not assume any responsibility either direct or implied, for omissions or duplications by the Contractor and any Sub- Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.11 ENGINEER'S APPROVAL:

- A. In any statement under this Contract where "approval" is required or requested, it is understood that such approval must be obtained from the Engineer in writing before proceeding with the proposal, and an adequate number of copies of such proposal shall be submitted to the Engineer.
- B. The approval by the Engineer of any materials, changes, drawings, etc., submitted by the Contractor will be considered as general only and to aid the Contractor in expediting his work. Such approval as may be given does not in any way relieve the Contractor from the necessity of furnishing the material and performing work as required by the drawings and specifications.

1.12 LOCAL RESTRICTIONS:

- A. Contractor shall become familiar with rules and regulations of the City, County, and State; or any other authority having jurisdiction over this project; and if, in his opinion, any work or materials shown on the drawings or specified do not comply with these rules and regulations as to size, type, capacity, and quality, he should make it known prior to the submission of his bid, which shall be deemed evidence of compliance; otherwise, the Contractor shall be responsible for the approval of work or material; and, in the event that any such authority should indicate disapproval, he shall correct same with materials approved by the Engineer at no additional cost to the Owner

1.13 ELECTRIC WIRING:

- A. The Mechanical Contractor shall erect motors in place ready for power connection and where scheduled or indicated on plans, shall furnish with each such motor a starter of the type specified and deliver it in good condition to the Electrical Contractor for installation. The

Electrical Contractor shall mount such starters as directed, furnishing supporting structure where necessary. Those who furnish motors and equipment shall also furnish with each item necessary instructions and wiring diagrams to the Electrical Contractor. Refer to Electrical Sections of the Specifications to determine in further detail the scope of the electrical work.

- B. Equipment actually installed on the project generally differs slightly from the equipment specified. To avoid incompatible branch service, prepare a list of electrical consuming items being installed in the project under this contract, which lists volts, phase, service factor, etc., of each and every piece of equipment or electrical device. Formally transmit the list to the Electrical Contractor to verify the compatibility of the electric service provided to each item. This coordination shall be completed prior to finalizing equipment and material purchases for the project.
- C. If the Contractor furnishes motors differing in size from those scheduled, he shall notify the Electrical Contractor and make provisions for revised electrical and pay for any changes necessary.

1.14 RESPONSIBILITY:

- A. Contractor shall be held responsible for the satisfactory and complete execution of work included. He shall produce complete finished operating systems and provide incidental items required as part of his work, regardless of whether such item is particularly specified or indicated.

1.15 GUARANTEE:

- A. Contractor shall furnish a written guarantee in triplicate warranting all materials, equipment, and labor furnished by him to be free of all defects, for a period of one year from date of final acceptance by the Owner. He shall further guarantee that all equipment shall meet the characteristics, capacities, and workmanship specified; and should any defects or non-performance of equipment be indicated within the warranty period, the defects and/or equipment will be repaired or made good without cost to the Owner.

1.16 REFERENCE ABBREVIATIONS:

- A. References are made in the various mechanical sections to technical societies, codes, specifications, trade organizations, and regulatory authorities in accordance with the following abbreviations:

1. AABC - Associated Air Balance Council
2. AFE- Air Filter Institute
3. AGA- American Gas Association
4. AMCA- Air Moving and Conditioning Association
5. ANSI- American National Standards Institute
6. ARI- Air Conditioning and Refrigeration Institute
7. ASHRAE- Society of Heating, Refrigeration and Air Conditioning Engineers
8. ASME- American Society of Mechanical Engineers
9. ASTM- American Society for Testing and Materials

10. AWSC- American Welding Society Code
11. AWWA- American Water Works Association
12. CISPI- Cast Iron Soil Pipe Institute
13. CTI- Cooling Tower Institute
14. FM- Factory Mutual
15. FS- Federal Specification
16. IRI- Industrial Risk Insurers
17. ISO- Insurance Services Organization
18. NAFM- National Association of Fan Manufacturers
19. NCPWB(MCAA)- National Certified Pipe Welders Bureau (Mechanical Contractors Association of America)
20. NFC- National Fire Codes
21. NFPA- National Fire Protection Association
22. PDI- Plumbing and Drainage Institute
23. SBI- Steel Boiler Institute
24. SMACNA- Sheet Metal and Air Conditioning Contractors National Association
25. UL- Underwriters Laboratories, Inc.

1.17 SHOP DRAWINGS AND DATA TO BE SUBMITTED:

A. SUBMITTALS WHICH DO NOT MEET THE FOLLOWING REQUIREMENTS WILL BE IMMEDIATELY REJECTED WITHOUT FURTHER REVIEW!!!

1. Catalog cutsheets and brochures will be preceded by a neatly arranged cover sheet having ample room for shopdrawing stamps and bearing the following information in a prominent, immediately visible location and size:
 - a. Equipment name or number as referenced in the contract Documents (example: "AHU-A" or "Type A" light fixture).
 - b. All options or accessories provided.
 - c. Applicable Specification section and paragraph numbers.
2. Substitutions -
 - a. Cross reference individual manufacturer and catalog numbers of substitute products to those of specified material.
 - b. Prior to requesting permission to use substitute or alternate products, the Contractor shall investigate and make certain that the product-
 - 1) Conforms with the standard of performance and quality specified.
 - 2) Will physically fit in the space allocated, with sufficient access and maintenance space.
 - 3) Involves no additional costs to the Owner or extended construction time.
 - c. Should the use of a substitute product entail any changes in details or construction, the changes and information documenting the complete coordination with all affected trades shall be submitted prior to approval of substitution.
 - d. Provide with requests for permission to use substitute or alternate products, drawings, specifications, samples, performance data and other information as may

be required to assist in determination of acceptability of the product. The burden of proof is the Contractor's responsibility.

3. All similar or related items shall be submitted together under one cover sheet (i.e. fixtures, insulation, valves, equipment). Do not piece-meal submittals!!!

B. Equipment Items:

1. Submit manufacturer's certified data relative to equipment required for the installation of the HVAC, plumbing and fire protection systems.
2. Submit adequate engineering data on each piece of equipment to allow a careful check of compliance with the technical requirements of the Contract Documents. Clearly indicate on submittal data the manufacturer's name, piece number, equipment capacity, and other applicable technical data.
3. Submit the following data for Mechanical Systems-
 - a. Foundations, Supports, Hangers, Inserts.
 - b. Insulation.
 - c. Ventilation and Air Conditioning Equipment, Specialties and their Control Systems.
 - d. Special Products Furnished by Mechanical Trades.
 - e. Openings, Special Framing and Access Doors.
 - f. Data for Testing and Balancing of the Heating, Air Conditioning and Ventilating Systems.
 - g. Installation Instructions - Submit Manufacturer's Printed Installation Instructions.
 - h. Temperature Controls.
 - i. HVAC Piping and Fittings
 - j. Air Devices.

1.18 INSTRUCTIONS:

- A. The Contractor shall furnish the services of competent instructors who will give full instruction to designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements of the equipment in each mechanical system. Each instructor shall be thoroughly familiar with all parts of the installation.
- B. The Contractor shall be responsible for videotaping all training sessions and shall submit two copies of the training videos on DVD discs.
- C. The number and length of training sessions shall be as specified in the various Sections of the Specification.
- D. These requirements are supplemented by requirements for specific equipment or systems in the various Sections of the Specification.

1.19 OPERATING AND MAINTENANCE MANUALS:

- A. Bind in looseleaf binders with the words, "Operating and Maintenance Manual" and the Project identification imprinted on the cover. Prepare four complete sets of records for the Owner, with table of contents, index, and tabbed Section dividers.
- B. During the construction period, accumulate the following for inclusion in the Operating and Maintenance Manuals-
 - 1. Copies or warranties and guarantees on each piece of equipment installed.
 - 2. Fixture brochures.
 - 3. Wiring and Control Diagrams.
 - 4. Approved Shop Drawings.
 - 5. Operating instructions for-
 - a. HVAC Systems.
 - b. Temperature Controls.
 - 6. Recommended maintenance procedures.
 - 7. Lists of major items of equipment with name, address, and telephone number of each local representative.
- C. Submit the manuals for approval at approximately 75 percent job completion.
- D. Each manual shall consist of-
 - 1. Complete description of each item of equipment and apparatus furnished and installed - including ratings, capacities, and characteristics.
 - 2. Fully detailed parts list, including all numbered parts of each item of equipment and apparatus furnished and installed.
 - 3. Manufacturer's printed instructions describing operation, servicing, maintenance and repair of each item of equipment and apparatus.
 - 4. Typewritten record of all tests made of materials, equipment, and systems. All such records shall state the date tests were conducted, the names of all persons making and witnessing the tests, and citing any unusual conditions relevant to the tests.

1.20 RECORD DRAWINGS:

- A. Accumulate Record Drawings during the construction of the Project. Keep one set of blue-line Contract Drawings at the job site at all times, and mark changes, rerouting or modifications which occur, clearly on the Drawings with dimensions.
- B. At completion of the job, deliver Record Drawings to the Engineer. Record Drawings shall be submitted for approval prior to final payment.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer's names and catalog numbers are scheduled or specified for the purpose of establishing standard of design, quality, appearance, performance and serviceability, and not to limit competition. Scheduled products (as may be modified by detailed specifications) are those selected as the basis for system design with respect to physical size and space arrangements, required capacity and performance characteristics, and the product quality intended.
- B. The Drawings indicate specified products physically arranged in the spaces, as cataloged by specific manufacturers, generally as listed in the Equipment Schedules.
- C. Listed "Acceptable Manufacturer's" are those considered capable of manufacturing products conforming to detailed Specifications, and as such, are invited to compete on an equal basis provided the offering is comparable in every respect to scheduled or specified products and actually conforms to the detailed Specifications and Schedule requirements. Listing herein as "acceptable manufacturers" does not imply "accepted", "approved", or "prior approval", or any other such connotation. All product offerings must be submitted for approval after Contract award.
- D. Vendors are invited to submit material or equipment bids to bidding Contractors on any comparable equivalent product, whether or not the manufacturer of such product is listed herein as an "acceptable manufacturer". Such product bids should clearly indicate offerings that are not listed as "acceptable manufacturers". In the event a bidding Contractor, after satisfying himself that such unlisted product is in fact "equal" to the specified product with respect to design, quality, performance and arrangement (space requirements), and the Contractor desires to furnish that product on the Project, he may request the name of the manufacturer be added to the list of acceptable manufacturers by addendum prior to bid time.
- E. At a bidder's request, an unnamed manufacturer's equipment will be considered to determine additional "acceptable manufacturers" if a request is made in writing no later than ten days prior to the bid opening. If such requests are found acceptable, an addendum will be written listing additional acceptable manufacturers. Consideration will be given only to requests of bona fide bidders (Contractors), not to those received from vendors.
- F. Manufacturers of materials and equipment shall be as specified, scheduled, or as listed in each respective product Specification Article.

2.2 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS:

- A. Materials and adhesives used throughout the mechanical systems for insulation, acoustical lining, filters, ducts, flexible connections, and jackets or coverings regardless of kind, or for piping or conduit system components, shall have a flame spread rating not over 25 without evidence of continued combustion and with a smoke developed rating not higher than 50. If such materials are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not higher than 50. (Note: materials need not meet these requirements where they are entirely located outside of a building and do not penetrate a wall or roof, and do not create an exposure hazard or where specifically exempted in the body of these Specifications).
- B. "Flame Spread Rating" and "Smoke Developed Rating" shall be as determined by the "Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E84,

Underwriters Laboratories, Inc., Standard". Such materials are listed in the Underwriters Laboratories, Inc. "Building Materials List" under the heading "Hazard Classification (Fire)".

2.3 IDENTIFICATION OF PIPING, AND EQUIPMENT

- A. Identify mechanical equipment in main mechanical room only with nameplate bearing equipment name, number, module, and room(s) served (use room numbers on architectural plans), using bevel edges, 1/16-inch thick, 1 1/2- inch white laminated Bakelite with engraved black letters, 1/2-inch (double line) or 7/8-inch (single line) high, permanently mounted on the equipment in a conspicuous place with screws.
- B. Markings - Identify each piping system in main mechanical room and immediately inside tunnel access doors with the direction of flow (where applicable) indicated by legends and flow arrows. The markings shall be applied after all cleaning of the piping and insulation is completed. Identify with semi rigid mechanically applied plastic marked bands with background color coded per ANSI A13.1. Color of lettering and flow arrow shall be black. Marker material shall completely encircle the pipe when smaller than 8-inch ips.
1. Provide 1/2-inch letters, 8-inch long color field on outside diameters less than 1 1/2-inch.
 2. Provide 3/4-inch letters, 8-inch long color field on outside diameters of 1 1/2 to 2-inch.
 3. Provide 1 1/4-inch letters, 12-inch long color field on outside diameters over 2-inch, but smaller than 8-inch.
 4. Provide 2 1/2-inch letters, 24-inch long color field on outside diameters of 8-inch to 10-inch.
 5. Provide 3 1/2-inch letters, 36-inch long color field on outside diameters larger than 10-inch.
- C. The legend and flow arrow shall be applied at each valve location, and at each point where piping enters or leaves a wall, partition, bulkhead, cluster of piping or similar obstruction..
- D. Variations or changes in locations and spacing shall be made to meet conditions.
- E. Wherever two or more pipes run parallel, the printed legend and other markings shall be applied in the same relative locations so as to be in either vertical or horizontal linearity, whichever the case may be.
- F. The markings shall be located so as to be conspicuous and legible from any reasonable point.
- G. Standard pipe and conduit identification symbols.
1. CW - Domestic Cold Water.
 2. HW - Domestic Hot Water.
 3. THW - Tempered Domestic Hot Water.
 4. HWR - Domestic Hot Water Recirculation.
 5. SS - Sanitary Sewer.
 6. SV - Sanitary Vent.
 7. ST - Storm Drainage Piping
 8. GAS - Natural Gas.
 9. CHS – Chilled Water Supply.
 10. CHR – Chilled Water Return.

11. HS – Heating Water Supply.
12. HR – Heating Water Return.
13. REF – Refrigerant.
14. D - AC Condensate Drain.

H. Underground Warning Tapes for Buried Lines-

1. Provide 3-inch wide metallic core brightly colored polyethylene detection tape, shallow buried in the trench above nonmetallic pipes, serving the dual purpose of line location and identification. The tape shall be easily detected by any commonly used metal detector and shall bear a printed message (continuous along entire length) describing the contents of the line beneath.
2. Provide 6-inch wide brightly colored polyethylene tape, shallow buried in the trench above metallic pipes, to identify the contents of the line beneath. The tape shall bear a printed message (continuous along entire length) describing the type of the buried line and its contents.

I. Provide valve tags schedules and valve charts for each piping system consisting of Schematic Drawings of piping layouts along with a valve list, showing and identifying each valve by number, service, and location and describing its function. Upon completion of the Work, mount two copies of each chart, sealed to rigid backboard with clear lacquer, placed under glass and framed, on the wall. Two additional unmounted copies shall be delivered to the Owner.

J. Valve Tags - Provide 1 1/4-inch x 1 1/4-inch square laminated plastic name tags with 1/4-inch engraved letters for all valves, with black letters on white tags, marked for type of service intended. Attach tags to valve handles by "S" hooks.

K. Nameplates and tags shall correspond to the Record Drawings.

L. Submit complete details of identification legends, color fields, and sizes, coordinated between trades.

M. Acceptable Manufacturers - Seton Nameplate Corporation, W.H. Brady, Westline.

2.4 BEARINGS

A. All bearings supplied to the Project, regardless of supply responsibility or applications as integral parts of machinery, shall be standard catalog items and interchangeable with those of manufacturers currently represented in the local trade area with replacements stocked locally. Ball bearings shall be radial or thrust design, sealed and enclosed in a dust and moisture proof housing, and selected in accordance with AFBM Rating B-10 for at least 200,000 hour operating life as applied. Grease lubricated bearings shall be arranged for regreasing through alemite fittings located outside machinery enclosures in a convenient location, with grease relief fittings in the bearing housing to prevent overgreasing or seal rupture.

B. Acceptable Manufacturers - Andrews, Dodge, Fafnir, Hyatt, Link-Belt, MRC, McGill, New Departure, Sealmaster, SKF, Shafer, Rollway, Thompson, Timken, Torrington.

2.5 ELECTRIC MOTORS

- A. Shall conform to the requirements of IEEE, NEMA, and shall have voltage, phase, frequency and service as scheduled.
- B. Each item of motor driven equipment shall be furnished complete with the motors, drives and control equipment, including remote pilot devices as required to perform the specific function for which it is intended.
- C. Motors shall be sleeve or ball bearing type selected for quiet operation, shall be manufactured for general purpose duty, with each bearing accessible for lubrication, and designed for the load imposed by the drive.
- D. Motors 1/2 horsepower and larger shall have bearings with pressure grease lubrication.
- E. Motors connected to drive equipment by belt shall be furnished with adjustable slide rail bases except for fractional horsepower motors which shall have slotted bases. Motor leads shall be permanently identified and supplied with connectors.
- F. Provide open dripproof enclosures for motors located indoors in dry locations, and splashproof enclosures in wet locations. Motors to be installed outdoors shall be totally enclosed fan cooled.
- G. Unless otherwise scheduled, motors ½ horsepower and smaller shall be electronically commutated motors, designed for 120 volt, single phase, 60 Hz alternating current.
- H. Unless otherwise scheduled, motors larger than ½ horsepower shall be premium efficiency and shall meet the requirements for premium efficiency motors as defined in NEMA MG 1, latest edition. Minimum efficiencies and power factors shall not be less than listed in NEMA MG 1. The motor nameplate shall bear the designation "PREMIUM EFFICIENCY" as well as the efficiency and power factor.
- I. Unless otherwise scheduled, motors 1/2 horsepower and larger shall be squirrel cage induction type, for scheduled voltage, 3 phase, 60 Hz alternating current.
- J. Each motor shall be free from magnetic hum, designed for quiet operation.
- K. Each motor shall be suitable for the brake horsepower of the driven unit, rated with 1.15 minimum service factor, with the temperature rise not to exceed NEMA standards and shall be capable of withstanding momentary overloads of 25 percent without injurious overheating.
- L. Electrical Specifications - Copper windings, winding insulation system NEMA Class B or better, wound for standard voltages. Motors shall conform to NEMA Design B as a minimum.
- M. Mechanical Specifications - Frame dimensions conform to NEMA standards for "T-Frame" motors. Frame construction of motors larger than NEMA frame 145T of cast-iron or extruded aluminum construction and those of NEMA frame size 145T and smaller may be fabricated steel type. Nameplates shall be stainless steel. Grease lubricated ball or roller bearings shall be supplied unless otherwise specified. On NEMA frame sizes 182T and larger make provisions for regreasing by use of removable grease plugs.
- N. Acceptable Manufacturers - Allis Chalmers, Baldor, Century, General Electric, Ideal, Lincoln, Louis Allis, Marathon, Reliance, U.S., Wagner, Westinghouse.

2.6 MOTOR STARTERS

- A. Except where otherwise specified or scheduled, each starter shall be furnished by the supplier who furnishes the equipment it controls.
- B. Provide a manual or magnetic starter for each motor. Where such devices are included in an "Equipment Control Schedule", they shall be as scheduled. Otherwise, they shall be as recommended by the equipment manufacturer.
- C. Magnetic starters shall include overload protection for each phase wired with normally closed contacts in series control circuit ahead of any other control contacts on the control side of the solenoid coil, and no contacts between the other side of the solenoid coil and the control power source. Motor starters shall conform to NEMA Standards for Industrial Control for 3 phase motors, No. 1C-1, with 120 volt (maximum) control circuit and control power transformer.
- D. Where individual starters and disconnect switches (or circuit breakers) are indicated to be in the same location, furnish combination devices in a common housing. Fused disconnects shall have rejection type fuse clips and Class RK-1 fuses.
- E. In every instance where magnetic starters are not required, furnish manual starters for fractional horsepower single phase motors - "ON-OFF", snap switch type with soldered ratchet overload protection.
- F. When interlocking or automatic control of single phase motors is indicated or required, the motors shall be furnished with magnetic across-the-line starters.
- G. When interlocking or automatic control of electric heaters is indicated or required, the heaters shall be furnished with contactors. Provide control power transformers as required to maintain control circuit voltages not exceeding 120 volts.
- H. Provide with each magnetic starter a reset button, pilot light, and HAND-OFF-AUTO switch, heavy duty type, mounted in starter cover. Provide field reversible (normally open or normally closed) auxiliary contacts required for interlocking but in no case less than two per starter.
- I. Acceptable Manufacturers - Allen Bradley, Cerus, Cutler-Hammer, General Electric, I-T-E, Square D, Westinghouse.

2.7 ACCESS DOORS:

- A. Furnish, for installation under appropriate Section of the Work, access doors at each point required to provide access to concealed valves, dampers, damper operators, and other devices requiring operation, adjustment, or maintenance.
- B. Shall be 16 gage steel, with mounting straps, concealed hangers, and screwdriver locks, designed for the doors to open 180 degrees, minimum.
- C. Access doors installed in fire walls or partitions shall be UL labeled to maintain surfaces.
- D. Provide prime coat finish for installation in ceilings or painted or unfinished surfaces.

- E. Provide polish chrome plate finish for installation in unpainted finished walls.
- F. Acceptable Manufacturers - Baldwin, Hannon, Josam, Miami, Carey, Milcor, Titus, Wade, Walsh, Zurn.

2.8 METAL STRUT FRAMING SYSTEMS:

- A. Shall be a basic adjustable slotted steel framing system consisting of components specifically designed for the support of mechanical and electrical systems. Parts shall include modular type channels, available with or without bolt holes, knockouts, or slots, with fittings and hardware requiring no welding, drilling, or other complex fabrication techniques. Basic attachment to channel shall be by means of spring mounted gripping nuts with serrated grooves, and bolts.
- B. Available accessories shall include brackets, baseplates, rod connectors, pipe and conduit straps, pipe and conduit hangers, beam clamps, cable clamps, concrete inserts and closure strips.
- C. Loading shall not exceed manufacturer's published load capacities for parts, connections, and assemblies for the actual spans involved.
- D. Shall be UL listed for the purpose when utilized as electrical raceway.
- E. Acceptable Manufacturers - B-Line, Elcen, F and S, Kindorf, Power Strut, Unistrut.

2.9 SLEEVES, INSERTS, ANCHORS AND SUPPORTS:

- A. Provide in concrete, carpentry or masonry construction, hangers, sleeves, expansion bolts, inserts, supporting steel, or other fixtures necessary for the support of pipe, equipment and devices furnished under each Section of the Specifications.
- B. Provide each pipe, conduit, or duct passing through walls, floors, ceilings or partitions with sleeves having internal dimension approximately 1-inch larger than the outside dimension (including installation) of pipes, conduits or ducts.
- C. Sleeves through interior partitions and floors shall be no less than 22 gage galvanized steel, set flush with the finished surfaces.
- D. Sleeves through mechanical room floor shall match existing.
- E. Attachments to structure shall be by means of beam clamps wherever practicable.
- F. Acceptable Manufacturers - Grinnell, Hilti, Phillips, or Thunderline.

2.10 FIRE STOPPING:

- A. Seal annular spaces between sleeves and penetrating materials in fire rated floors, ceilings, and walls with fireproof and waterproof silicone elastomer applied in accordance with the manufacturer's published instructions. Multiple penetrations shall be sealed with silicone caulking. Seal material shall be UL classified for use in fire rated penetration seals, and shall be

applied in the manufacturer's recommended thickness for the fire rating of the penetrated structure in accordance with ASTM-E-814 requirements.

- B. Acceptable Manufacturers - Dow Corning, General Electric, Hilti.

2.11 WATERPROOFING:

- A. Seal penetrations of wet or potentially wet structures, floors, exterior walls, etc., other than those requiring fire stopping, with sealant to prevent moisture leakage. Apply sealing material (calking) in accordance with manufacturer's published instructions.
- B. Product Research and Chemical Co. "Poly-Sulphide Sealant" PRC- 5000.

2.12 AUXILIARY STRUCTURAL SUPPORTS:

- A. Provide auxiliary structural supports as necessary to support mechanical systems from the building structure. Coordinate with structural drawings. Supporting members shall be metal strut framing or standard structural shapes, designed to support imposed loads with a working stress no greater than 25 percent of ultimate stress values of the members, and articulation with the building structure without exceeding structural limitations at the point of attachment to the building structure. Prepare calculations and Shop Drawings of each such support and submit for acceptance. Begin no work until receipt of acceptance from the structural engineer.

2.13 ESCUTCHEONS:

- A. Provide escutcheons or 22 gage minimum painted galvanized sheet metal wall flanges (in event standard manufactured product does not exist) for mechanical or electrical penetrations of floors, ceilings, walls or partitions. Escutcheons shall be sized to enclosed the outside of the penetration sleeve and fit snugly to the pipe (or over outside of insulation) of insulated lines. Both exposed surfaces of such penetrated elements shall be fitted with escutcheons which shall both afford a finished appearance and prevent passage of vermin.
- B. Except where otherwise specified, escutcheons shall be one- piece (where practicable) or split, hinged, stamped brass type designed to fit the pipe, and to cover the terminating pipe sleeve, in chrome plated finish, with securing device to hold the escutcheon tight to the pipe.
- C. Use deep escutcheon on each sleeve set in a waterproof concrete floor.
- D. Acceptable Manufacturers - Beaton and Corbin, Grinnell, Sweet and Donaldson.

2.14 ROOFTOP EQUIPMENT SUPPORTS AND PIPE CURBS:

- A. Provide insulated, leakproof equipment supports and pipe curbs approved by the National Roofing Contractor's Association for roof mounted equipment, pipe, or conduits. Supports shall be prefabricated of continuous welded 18 gage minimum galvanized steel, 12-inch minimum height, mitered corner seams, integral cant and base plate, 2 x 4 fire resistant treated wood

nailer, and 18 gage counterflashing. Provide integral internal reinforcing necessary to support imposed load, but no less than 600 pounds per linear foot of perimeter.

- B. Provide raised cant, thickness to match thickness of roof insulation.
- C. Top surface shall be level. Provide pitched base where installed on pitched roof.
- D. For pipe curbs, coordinate conduit requirements with Division 26, to provide required openings in a single curb.
- E. Acceptable Manufacturers - Pate, Roof Products Systems, Stiles, Thycurb.

2.15 FLASHINGS:

- A. Furnish weatherproof flashings for mechanical system related openings through the roof and walls.
- B. Furnish roof flashing for round and rectangular openings, pipes, vents, machinery, devices, or ducts. The flashings shall be constructed to terminate not less than 12-inches above the roof. Provide suitable counterflashing constructed from the same material as the flashing.
- C. Furnish flashings for mechanical curbs, and furnish and install counterflashing at each.

2.16 PIPE HANGERS AND SUPPORTS:

- A. Hold piping in place by accepted hangers, supports and anchors, designed to support weight of pipe, weight of fluid and weight of pipe insulation. Arrange hangers to prevent transmission of vibration from piping to building and supports. Allow clearance for application of specified vapor sealed insulation without cutting pipeline covering or fitting covering in installation of pipe hangers and fittings. Uninsulated copper or brass pipe or tubing shall be isolated from ferrous hangers or supports. Piping shall not be supported from roof decking. Furnish and install angle members to span steel joists or distribute load.
- B. Suspend and support horizontal and vertical piping from the structure with hangers and metal strut framing system or structural steel supports, spaced as scheduled. Furnish necessary accessories, nuts, lock nuts, bolts, rods and devices to allow installation to freely expand and contract. Hangers shall be formed steel clevis type, unless otherwise specified, with adjustable attachment to hanger rod. For copper or brass pipe, use plastic sheathed hangers to eliminate all possibility of galvanic action between hanger and copper tubing. Pipe hangers shall fit over vapor sealed insulated piping.
 - 1. Clevis - Grinnel Fig. 260 or 590.
 - 2. Uninsulated copper tubing - Grinnell Fig. CT-99C.
- C. Where pipe exceeds maximum loading recommended for clevis type hanger and for attachment to vertical pipes, provide steel pipe clamps.
 - 1. Double bolt pipe clamps - Grinnell Fig. 295.
 - 2. Riser clamps - Grinnell Fig. 261.

3. Copper tubing riser clamps - Grinnell Fig. CT-121-C.
- D. Provide trapeze hangers where several pipes can be installed parallel and at same level. Trapeze of standard structural steel shapes sized to support load and drilled for rod hanger at each end.
 1. Grinnell Fig. 46.
- E. Use roller supports with cast iron adjustable bases, where provision for expansion is required.
 1. Grinnell Fig. 274.
- F. For hanger rods on piping 3/4-inch thru 2-inch inclusive, use 3/8-inch thru 3 1/2-inch inclusive, use 1/2-inch rods; for 4- inch thru 5-inch inclusive, use 5/8-inch rods; for 6-inch, use 3/4-inch rods; for 8-inch thru 12-inch, use 7/8-inch rods; and for piping larger than 12-inches, use 1-inch rods.
- G. Provide additional steel members required for hanging piping systems in areas with special conditions, or where vertical or horizontal structural steel supports are required other than those provided in the structure.
- H. Provide oversize hangers with hanger shields or blocking the same thickness as insulation to pitch insulated pipes accurately at time of installation.
- I. C-Type hangers on sprinkler piping shall have lock nuts.
- J. Attach supporting rods to concrete by drilled anchors or inserts placed before concrete is poured.
- K. Provide lateral bracing for supporting rods over 18-inches long braced at every fourth hanger with diagonal bracing attached to slab or beam.
- L. Attach supporting rods to precast structural members on sides by expansion bolts located above steel reinforcing at minimum of 6-inches above the bottom. Power driven devices shall not be used.
- M. Floor Supports - Provide for supporting horizontal piping from floors with cast-iron pipe rests, with pipe nipples to suit. Fasten to floor. Where provision for expansion is required, provide pipe roll stands, without vertical adjustment. Provide concrete or steel pipe piers; fasten stands to piers.
- N. Wall Supports - Provide for supporting horizontal piping from wall with steel J-hook for pipe located close to wall and no larger than 3-inch pipe. For greater loads, up to 1500-pound maximum loading, provide welded steel bracket.
- O. Use inserts of drilled anchors in concrete construction, use beam clamps in steel construction.
- P. Hanger spacing schedule, except for nonmetallic, cast iron, or fire protection systems, shall be as follows:
 1. 1/2 and 3/4-inches 6-feet
 2. 1-inch 7-feet

- | | | |
|----|----------------------|---------|
| 3. | 1 1/4-inch | 8-feet |
| 4. | 1 1/2-inch | 9-feet |
| 5. | 2-inch | 10-feet |
| 6. | Larger than 2-inches | 12-feet |

- Q. Furnish miscellaneous steel necessary to support piping systems, including those accessories required for trapeze or group hanging.
- R. Acceptable Manufacturers - B-Line, Grinnell, Burt Patterson, Elgen, F and S Fee and Mason,, Michigan, Modern.

PART 3 - EXECUTION

3.1 PROTECTION OF EQUIPMENT:

- A. Protect equipment from physical damage and deterioration after it is delivered to the Project, and during the installation period prior to Owner acceptance.
- B. The equipment shall be kept clean. Motors and electrical devices shall be covered with suitable materials to prevent dirt or dust accumulation within equipment. Machinery and devices shall be properly oiled and maintained to prevent rusting and deterioration.
- C. Repair scratches, mars, or paint deterioration.

3.2 EXCAVATION AND BACKFILL

- A. Perform excavation and backfill required for the installation of underground pipe, ducts, equipment and devices.
- B. Cut trenches true and straight and grade bottom to afford uniform bearing of barrel on firm soil. Stack the excavation material in a suitable location. Shore trenches and excavated areas as required for safety, and for security of adjacent earth and structures.
- C. Cut through walks, roads, and other structures as necessary for the installation.
- D. Install underground mechanical piping and ducts with a minimum cover of 24-inches from finished grade, or as detailed on plans. Pipes carrying water shall be installed a minimum of six inches below the frost line.
- E. Trench width at and below top of pipe shall result in horizontal clearance between trench wall and barrel on both sides.
- F. Pipes smaller than 18-inch - at least 6, but no more than 8-inch clearance.
- G. Prepare trench bottom. Dig out of joints. Lay pipe in trench so that entire length bears on firm soil. No part of bell fittings shall support the remainder of the pipe.

- H. Provide embedment where indicated or if trench is unsuitable for support. Cut excavation a minimum of 6-inches below the required grade. A 6-inch bed of sand shall then be placed and properly compacted to provide accurate grade, and uniform bearing throughout the length of pipe or conduit. The sand shall consist of clean, natural, washed sand with particle sizes which will pass through a 3/8-inch screen, 90 percent through a quarter inch screen, and no more than 25 percent through a No. 50 screen.
- I. The backfilling shall not be placed until the Work has been inspected, tested and accepted.
- J. Backfill material shall be free of cinder or rocks, and free of clods or lumps larger than 1-inch, up to 12-inches above top of pipe, and 2-inches in remainder. If the excavated material is not suitable, provide adequate material from other locations.
- K. Backfill by installing clean earth in accordance with the above Specifications in layers no more than 6-inches thick, tamping (and wetting down, if necessary). Hand place and tamp each layer of initial backfill in 4-inch layers up to pipe centerline, and in 6-inch layers up to 12-inches above the top of pipe. Complete backfill to grade and create a substantial, well-compacted trench to 95 percent compaction by the standard Proctor test.
- L. Surplus earth or materials remaining after backfilling shall be removed from the site.
- M. Repair utilities, lines, walks, and roads, and other surfaces and structures damaged by these operations to match conditions existing prior to excavation.

3.3 EQUIPMENT SPACE:

- A. The Drawings indicate specified products physically arranged in the spaces, as cataloged by specific manufacturers, generally as listed in the Equipment Schedule.
- B. Coordinate the exact physical space requirements for equipment and servicing of equipment actually purchased for each item of equipment involved.
- C. Drawings show pipe and ductwork diagrammatically.
- D. Adhere to Drawings as closely as possible in layout of work.
- E. Vary run of piping, run and shape of ductwork and make offset during progress of work as required to meet structural and other interferences.
- F. Install piping and ductwork in furred spaces wherever possible. Run exposed piping and ductwork parallel to or at right angles to buildings walls.
- G. Keep horizontal lines as close to ceiling as practicable.
- H. Conform to ceiling heights established on architectural construction drawings.
- I. All equipment shall be installed to provide complete access for service, adjustment and filter replacement, as well as complete removal/replacement of unit from equipment room. Coordinate installation with all other trades to ensure that no piping, conduit, ductwork, structure, light fixtures, or other equipment obstruct complete access to the equipment.

Coordinate access requirements for equipment actually provided with equipment manufacturer. Equipment installation shall not impede access to room. Equipment installed in violation of these requirements will be removed and re-installed at contractor's expense.

3.4 INTERFERENCES:

- A. Relocate or reroute existing pipe, wiring, or ducts as required to facilitate construction of finished work as planned. Restore surfaces, insulation, and finish to match condition of adjacent work.

3.5 CUTTING AND PATCHING:

- A. Assume costs and responsibility for cutting and patching required to complete the installation.

3.6 PAINTING AND FINISHING AND CLEANING:

- A. Provide touchup painting of prefinished mechanical products.
- B. Surfaces shall be left clean, debris shall be removed, and equipment shall be furnished in prime coat finish ready for finish coats.
 - 1. Piping, ductwork and equipment - Clean exterior of piping, ductwork and equipment, removing rust, plaster and dirt by wire brushing. Remove grease, oil, and similar materials by wiping with clean rags and suitable solvents.
 - 2. Motors, pumps and other items with factory finish - Remove grease and oil and leave surfaces clean and polished.
 - 3. Plumbing Fixtures - Clean and polish fixtures immediately prior to final inspection.
- C. Cleaning operations are supplemented by detailed instructions for specific systems.

3.7 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES:

- A. Air supply outlets, return air inlets, exhaust air inlets, plumbing fixtures, and sprinkler heads may be relocated at the Owner's option to points within 10-feet of their indicated locations, at no additional cost to the Owner, provided the Contractor is notified prior to Shop Drawing preparation or roughing-in and fabrication.
- B. Only work which must be re-performed in this connection will be considered extra.

3.8 MECHANICAL SYSTEM VERIFICATION AND CALIBRATION:

- A. The mechanical contractor shall coordinate on-site system verification and calibration session(s) to document that the systems listed below are operating as intended. As a minimum, one 8-hour day shall be scheduled for the first session. Subsequent sessions shall be scheduled as needed until final verifications and calibration are complete.

1. The session shall follow complete installation and startup of all HVAC systems and the initial test and balance adjustments so that the integration effort will achieve the scheduled operation of each system.
- B. Session(s) shall be scheduled in advance and the General Contractor, Owner and Engineer shall be invited to attend.
- C. On-site attendance and participation in each session is mandatory for the following parties:
 1. Equipment/system installing contractor.
 2. Equipment manufacturer's factory authorized representative(s).
 3. Temperature Controls Contractor.
 4. Test and Balance Contractor.
- D. Parts, tools and expertise:
 1. The attending contractors and sub-contractors shall be equipped with typical components and materials to make corrections, adjustments and repairs of the installed equipment.
 2. The participants shall bring necessary tools and special equipment needed to make corrections or adjustments of the installed equipment and sub-systems where operation is being verified and/or calibrated.
 3. Personnel with the expertise to make full adjustments and/or programming changes shall be in attendance.
- E. Documentation of system verification and calibration:
 1. Verify the system operation through full operating range is correct by testing and measurement of the controlled variables and response of equipment during automatic operation. Verify through complete operating sequences put into effect by simulation of seasonal conditions by temporary adjustment of system setpoints and necessary control points.
 2. The equipment/system Contractor shall prepare a record of the findings of the verification and calibration of each equipment item and/or system. The recorded findings shall identify the sequences verified and whether they were accepted or failed. Verification of system operation shall include:
 - a. Operation sequences.
 - b. Set points.
 - c. Calibration and coordination of installed sensors and instrumentation.
 3. The Contractor shall identify items that do not operate as expected and those requiring further verification
- F. These requirements shall apply to the following equipment/systems:
 1. New HVAC systems and equipment.
 2. Temperature controls.
- G. The Mechanical Contractor shall submit a report documenting the verification sessions and results for each piece of equipment affected. All deficiencies and deviations from the specified performance shall be documented.

END OF SECTION 23 01 00

SECTION 23 85 00 - DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. Provide all necessary labor, equipment, and materials for a complete duct system, including all hardware and accessory devices.
- B. Install instrumentation devices in the duct system, furnished under Section 23 90 00.

1.2 STANDARDS:

- A. Ductwork shall be fabricated, erected and installed and fitted out with accessories in accordance with current editions of the following -
 - 1. Governing Building Codes.
 - 2. NFPA 90A.
 - 3. SMACNA HVAC Duct Construction Standards.

1.3 DEFINITIONS:

- A. Pressure - Velocity Classification - classifications of duct construction as defined in SMACNA HVAC Duct Construction Standards, First Edition, 1985 (Table 1-1).
- B. Lined Ductwork - ducts or plenums internally lined with fiberglass sheet as specified in Section 23 25 00.
- C. Insulated Ductwork - externally insulated as specified in Section 23 25 00.
- D. Preinsulated Ductwork - ductwork constructed of insulating material or incorporating insulating material during fabrication.

1.4 SUBMITTALS:

- A. Submit complete printed catalog and descriptive data for each major piece of equipment, clearly indicating exactly what features, options and accessories are being provided.
- B. See Section 23 01 00.

1.5 OPTIONS:

- A. Equivalent area round ducts may be substituted for rectangular ducts serving a single outlet provided the round duct tap is made into the rectangular with a round take-off fitting with integral volume damper as specified below.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Galvanized steel sheets, lock-forming quality, ASTM A-525 with minimum G60 galvanized coating for both sides of the sheet.
- B. Black steel sheets - conforming to ASTM A-366.
- C. PVC - seamless extruded type. This duct pipe shall be extruded from a Type I, unplasticized thermoplastic, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. All extruded PVC duct shall have a maximum flame spread rating of 25 or less per ULC S102.2. All PVC extruded duct pipe shall carry a maximum temperature rating of 140°F. All extruded duct pipe shall be manufactured in the USA, using domestic materials, by an ISO 9001 certified manufacturer, and shall be stored indoors at the manufacturing site until shipped from the factory. All extruded PVC duct pipe shall be marked with the manufacturer's name or identifying symbol.
 - 1. Acceptable Manufacturers - Harrison, Harvel Plastics, Spears.
- D. Proprietary Flanged Transverse Duct Joint Assembly - Ductmate system, applied and installed in accordance with manufacturer's published recommendations.
- E. Duct Sealant - United, Foster, Hardcast, Minnesota Mining Manufacturing.

2.2 FLEXIBLE CONNECTIONS:

- A. Woven nylon, 22 oz./sq. yd., 150 lb. tongue tear strength, 500 lb. tensile strength, flame retardant coating, proof fabric maximum 10-inches long, minimum 4-inches in direction of air flow.
- B. Acceptable Manufacturers – Ductmate, Durodyne, Hardcast, Ventfabrics.

2.3 MOTORIZED DAMPERS:

- A. Louver type with not less than 16 gauge welded steel frames and galvanized finish. Blades shall have interlocking edges, vinyl or neoprene gaskets, and Teflon coated stainless steel thrust washers. Blades shall be edged with neoprene.
- B. Actuators shall be driven by electrically powered motors and shall be sized to operate their appropriate dampers or valves with sufficient reserve power to provide 2-position action. Provide adjustable positive stops or limit switches on each actuator.

- C. Acceptable Manufacturers - Air Balance, Carnes, Empco, Greenheck, Krueger, Louvers & Dampers, Ruskin, Nailor Industries.

2.4 BACKDRAFT DAMPERS:

- A. Provide heavy-duty shutter type dampers, with galvanized 16 gage or extruded aluminum frame and wind stops, minimum 28 gage galvanized steel or 26 gage aluminum blades, 3/16-inch steel shaft with "Oilite" bronze bearings, roll formed blade edged with felt sealer, blades linked with tie bar and adjustable counter weight, to allow full blade position parallel to air flow under full air flow with gravity closing of dampers on reverse flow.
- B. Provide frames for required mounting and access doors required for complete adjustment of balance weight.
- C. Fan manufacturer's backdraft dampers are acceptable where furnished and installed in conjunction with exhaust fan installations scheduled, and similar to above.
- D. Acceptable Manufacturers - Air Balance, Carnes, Empco, Greenheck, Krueger, Louvers & Dampers, Ruskin, Nailor Industries.

2.5 FIRE DAMPERS:

- A. Constructed in accordance with NFPA Standard No. 90-A with Underwriters listed thermal element. Entire assembly shall bear UL 555 label. Increase duct area to compensate for frame area. Provide interlocking blade curtain or accordion type with positive closure in any position and a minimum free area of 90 percent of duct free area. For each ceiling air device with fire damper, provide UL listed ceramic radiation blanket.
- B. Acceptable Manufacturers - Air Balance, Greenheck, Nailor Industries, Inc., Prefco, Ruskin.

2.6 COMBINATION FIRE/SMOKE DAMPERS:

- A. Damper assembly with galvanized steel structural frame, galvanized steel blades, stainless steel or bronze bearings, extruded silicone rubber edge seals and flexible, compression type stainless steel jamb seals, and actuator, constructed in accordance with NFPA Standard No. 90-A.
 - 1. Fire resistance rating:
 - a. 1 ½ hour rating for installation in barriers with fire resistive rating less than 3 hours.
 - b. 3 hour rating for installation in barriers with fire resistive rating of 3 hours or more.
 - 2. Fire closure temperature: 350°F.
 - 3. Leakage Class I or II.
 - 4. Minimum velocity rating of 2000 fpm.
 - 5. Minimum pressure rating of 4 in. w.g.

- B. Damper frame shall be 16 ga. galvanized steel formed into a 5" x 1" structural hat channel. Top and bottom frame members on dampers less than 17" high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1 1/2" (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking.
- C. Entire assembly shall bear UL 555S, Class II label. Provide a 120 vAC, UL 864 listed, external mounted, electric motor actuator. A UL33 heat actuated link shall provide closure and containment independent of actuator positioning or signalling.
- D. Damper and actuator assembly shall be factory-tested to assure proper operation.
- E. Acceptable Manufacturers - Air Balance, Greenheck, Nailor Industries, Inc., Prefco, Ruskin.

2.7 VOLUME DAMPERS:

- A. Provide manual balancing dampers with position locking mechanism as shown and as required to balance the air flow to each outlet or from each inlet.
- B. Construction in accordance with SMACNA manuals.

2.8 FLEXIBLE DUCT:

- A. Flexible duct shall be light weight duct formed with a resilient core of continuous, chlorinated polyethylene inner air barrier and insulated with resilient 1 1/2-inch thick fiberglass and jacketed with a tough scrim-reinforced aluminum vapor barrier and containing a totally encapsulated reinforcing wire helix.
- B. Listed as UL 181, Class 1 duct. Complies with NFPA 90A and 90B.
- C. Provide flexible duct clamps of self-locking nylon, or stainless steel with swivel action screw.
- D. Acceptable Manufacturers - Flexmaster, Thermaflex.

2.9 ROUND TAKE-OFF:

- A. A round take-off made from a rectangular duct shall utilize fitting having rectangular opening with 45° transition to round collar on upstream side of fitting. Fitting shall include a butterfly damper with quadrant operator in round collar, with stand-off platform to extend quadrant beyond duct wrap for insulated duct. Provide a wing nut at each end of damper shaft. Fitting shall be equivalent to Wichita Sheet Metal Supply Co. model HETO.

2.10 SHEET METAL HARDWARE:

- A. Quality and configuration to conform to Ventfabrics, Inc. Piece number and description, as listed-

1. Ventfabrics No. 641 damper regulator, self-blocking, die- cast, secure to sheet metal on exposed and concealed ductwork above accessible ceilings.
2. Ventfabrics No. 677 damper regulator, self-blocking die- cast, chrome plated cover. To control ductwork located above an accessible ceiling or confined in wall spaces. Control from conditioned space.
3. Ventfabrics No. 607 damper end bearing, die-cast for rectangular ducts, with bearing and opening for shaft inclusion.
4. Ventfabrics No. 609 end bearing, die-cast for cylindrical ducts, with suitable gaskets, bearing and recess for shaft insertion.
5. Ventfabrics No. 615 and 616 tandem placed U-bolts, with washer and nuts to fix damper rod to damper blade.
6. Ventfabrics No. 699 die-cast instrument test hole, with screw, cap and gasket.
7. Ventfabrics No. 611, 160 F. fusible link, 15 lb. load capacity.
8. Ventfabrics No. 613, 212 F. fusible link, 15 lb. load capacity.
9. Ventfabrics No. 90, sash lock, cadmium plated stamp steel construction, for use on reach-thru doors.
10. Ventfabrics No. 220, die-cast door pulls for use on reach- thru access doors.
11. Ventfabrics No. 150, 2 x 1-11/16-inch galvanized duct hinges, minimum 2 hinges per door, for use on reach-thru access doors.

B. Acceptable Manufacturers - Duro-Dyne, Hardcast, Ventfabrics, Inc., Young Regulator.

2.11 FABRICATION:

A. Ductwork -

1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, latest edition.
2. Each duct system shall be constructed for the specific duct pressure of the system.
3. Pressure-Velocity Classification and seal class shall be as follows:
 - a. New supply and return ductwork shall be galvanized sheet metal constructed per requirements for the 2" water gage pressure class and seal class "C".
 - b. General exhaust ductwork shall be galvanized sheetmetal constructed per requirements for the 1" water gage pressure class and seal class "C".
 - c. Fume hood exhaust ductwork:
 - 1) Fume hood exhaust ductwork shall be PVC constructed per requirements for the 2" water gage pressure class.
4. Duct Sealant:
 - a. Seal new supply, return and general exhaust ductwork with Hardcast #601 water based, UL listed sealant or approved equivalent, in accordance with SMACNA HVAC Duct Construction Standards for required static pressure construction class and seal class.

B. Rectangular duct fittings-

1. Elbows, tees and splits shall be constructed with square turns or radius turns which shall have a centerline radius 1-1/2 times the width of the duct as an absolute minimum.
 2. If square turns are used, fabricate and install hollow formed turning vanes in each turn for elbows turns for elbows having equal inlet and outlet dimensions.
 3. Where elbows have unequal inlet and outlet dimensions, turning vanes shall have leading and trailing edges parallel with the air flow and shall be high efficiency profile type similar to those manufactured by the Aerodyne Company. Vane assemblies shall be made with Aerodyne side rails, and vanes shall be installed on design centers as for the vanes across the full diagonal dimension of the elbow. Cut center section of each rail as recommended by manufacturer so that the required position adjustment may be made.
- C. Round duct - Spiral seam, in accordance with SMACNA 1985 Duct Construction Standard.
1. Up to 15-inch: 26 gage steel spiral seam.
 2. 15 thru 26-inch: 24 gauge steel spiral seam.
 3. 28 thru 36-inch: 22 gauge steel spiral seam.
 4. 38 thru 50-inch: 20 gauge steel spiral seam.
 5. 52 thru 60-inch: 18 gauge steel spiral seam.
 6. Joints-
 - a. Beaded sleeve joints on spiral duct, 2-inch minimum lap.
- D. Round ductwork fittings-
1. Each 90 degree elbow shall be 2-piece welded, die formed construction, and shall have a center-line radius of not less than 1.5 times the duct diameter.
 2. Each elbow between 45 and 90 degrees shall be 3-piece construction, with same center-line radius requirements.
 3. Provide combination lateral elbow and tee, 90 degree tees, conical tees, double wye's and reducers each as required.
 4. Fittings shall be constructed from material 2 gauges heavier than spiral pipe. For systems up to 4 inches static pressure seams shall be spot welded and internally sealed. For systems greater than 4 inches static pressure seams shall be continuously welded.
- E. Fume hood exhaust duct –
1. PVC ductwork.
 - a. Joints – Solvent welded.
 - b. Round ductwork fittings –
 - c. Each elbow shall have a center-line radius of not less than 1.5 times the duct diameter.
 - d. Provide combination lateral elbow and tee, 90 degree tees, conical tees, double wye's and reducers, each as required.

2.12 DUCT LINER:

- A. Refer to Section 23 25 00.

2.13 GRILLES, REGISTERS AND DIFFUSERS:

- A. Provide as scheduled.
- B. Increase size when required for installation in lined ductwork.
- C. Air Distribution-
 - 1. Supply units shall be designed to provide the throw and spread required with no apparent drafts or excessive air movements within the ventilated or air conditioned spaces.
 - 2. Provide air distribution accessories required to affect these conditions as part of the supply unit.
- D. Noise-
 - 1. The noise spectrum of the supply units shall be no higher than N.C.-35 as defined in the latest issue of ASHRAE Guide.
 - 2. Units causing excessive air movement, drafts or objectionable noise shall be replaced at no cost to the Owner.
- E. Volume Control - Furnish supply outlets with key operated volume dampers, unless otherwise specified.
- F. Gaskets - Flanges of diffusers, registers and grilles shall be gasketed with foam rubber gaskets to prevent leaking and smudging.
- G. Finish - Furnish grilles, registers, and outlets in factory baked white enamel finish, also suitable as prime coat for finish painting in the field, except as otherwise specified or scheduled.
- H. Acceptable Manufacturers - Air Concepts, Anemostat, Barber- Colman, Buensod-Stacy, Carnes, Carrier, Conners, Krueger, Metalaire, Seiho, Titus, Tempmaster, Trane, Tuttle & Bailey, Nailor Industries.

PART 3 - EXECUTION**3.1 MATERIAL APPLICATION:**

- A. Galvanized steel sheets - use for fabrication of the following-
 - 1. Supply, return, exhaust ducts except as otherwise specified.
 - 2. Housings for coils, dampers, filters and fans.
 - 3. Roof ventilators and cowls.
 - 4. Volume control dampers.
 - 5. Intake and exhaust plenums, roof caps and goosenecks.
 - 6. Hangers for ducts.
 - 7. Flashing and counterflashing.
- B. PVC Ductwork - use for fabrication of the following -

1. Fume hood exhaust systems as described herein.
- C. Black steel sheets - use for fabrication of the following-
1. Fire and smoke damper sleeves.

3.2 DUCT SIZE AND ROUTING:

- A. Ductwork sizes and routing shown on drawings are schematic. Offset, flatten and maintain duct area, and reroute ducts where required to maintain headroom, clear light fixtures, pipes, conduits, structure and other construction.
- B. Do not route piping above electrical distribution equipment, per National Electric Code.

3.3 INSTALLATION:

- A. Flexible connectors-
1. Install on inlet and outlet of each piece of air handling equipment.
- B. Fire dampers and combination fire/smoke dampers -
1. Provide with complete access including duct access doors, and access doors for general construction. Duct sleeves and dampers shall be supported independent of ductwork. Install dampers within steel wall sleeves (or floor slab sleeves) and complete installation as recommended by manufacturer to maintain U.L. rating.
- C. Flexible duct-
1. Secure to duct, apply heat resistant fire retardant compound to male end of each piece of duct, insert into flexible duct, secure with draw in accordance with manufacturer's instructions.
 2. Flexible ducts shall have developed length of not more than 4-feet and be supported to eliminate sagging and afford smooth 1-1/2 center-line (minimum) bends. Do not bend flexible duct more than 45 degrees. Offsets greater than 45 degrees shall be provided with insulated rigid steel elbows.
 3. Ceiling diffusers shall be fitted with a 90 degree insulated rigid steel elbow before connecting to flexible duct.
- D. Fume Hood Exhaust -
1. Pitch at a minimum of 1/4-inch per foot to drain toward the fume hood.
 2. All changes in direction shall be made with radius elbows.
 3. Utilize PVC duct manufacturer's couplings, offsets, transitions, flanges, dampers, plenums and special fittings. Join sections with solvent cement in strict accordance with duct manufacturer's instructions.
 4. Do not install PVC ductwork in return air plenums.
- E. Volume balancing dampers-

1. Install at each split in each run of duct.
2. Install at each outside air and return air connection to each piece of air handling equipment.
3. Install at no additional charge, any additional dampers required by the test and balance contractor.
4. Make provisions necessary to ensure that all dampers are easily accessible for balancing and future adjustment.

F. Sheet metal hardware-

1. Install as required and in accordance with manufacturer's recommendations.

G. Air devices-

1. Each air outlet of each duct system shall be equipped with a balancing damper, either integral with the device or located in the individual branch duct to balance the airflow from that device.
2. These devices shall be installed after the duct systems are thoroughly cleaned, with suitable accessories as specified or required for proper air distribution.
3. For adjustable throw air devices - the contractor, upon request by the Owner or Architect, shall return to the job within one year of substantial completion to adjust the throw of adjustable air devices.

H. Automatic dampers -

1. Install automatic dampers except dampers specified as integral parts of factory fabricated air handling unit components.

I. Acoustical lining-

1. The duct dimensions shown on Drawings are inside of the lining.
2. Install in accordance with SMACNA and manufacturer's recommendations using adhesive and fasteners with washers.
3. Provide sheet metal internal transition fitting on leading edge of lined ductwork connections to equipment, flexible connections, or unlined duct. Transition shall afford smooth air flow into lined duct, with no more than 45 degree break angle, and overlap leading edge of lining at least 1-1/2-inches.

3.4 ERECTION:

A. Hangers-

1. Provide round hangers, strap hangers, or trapeze shelf hangers in accordance with SMACNA standards.
2. Rectangular ducts 0 thru 47-inches wide, use 18 gage galvanized strap, 10 feet on center, 1-inch strap.
3. Rectangular ducts 48-inches and wider, use trapeze hangers formed of angle iron under duct rigidly and securely supported to building structure by threaded rods, installed per SMACNA standards.

4. Cylindrical, single wall ducts - 0 thru 36-inches in diameter, use 18 gage galvanized strap, 10 feet on center, 1-inch strap.
5. Cylindrical, single wall ducts over 37-inches on diameter, use 16 gage galvanized strap, 10 feet on center, 2-inch strap.
6. For cylindrical, double wall ducts, refer to drawings and SMACNA standards.
7. For vertical ducts - 0 thru 24-inches in any dimension, use 1 x 1 x 1/8-inch galvanized angle. Secure angle to duct at each floor level, rest angle on building structure.
 - a. Ducts 25-inches thru 60-inches use 1 1/2 x 1 1/2 x 3/16-inch galvanized angle.
 - b. Ducts over 61-inches use 2 x 2 x 3/16-inch galvanized angle.
 - c. Support to the building construction and secure to duct.
8. Support flexible ducts with 18 gage, 1-inch wide galvanized straps, with span lengths as short as necessary to prevent sagging.
9. PVC fume hood exhaust duct - use galvanized split clamps and hangers. Hanger material and spacing shall be in accordance with the duct manufacturer's recommendations for each duct size.

3.5 ACCESS DOORS:

- A. Provide duct access doors as required to clean kitchen hood exhaust ductwork. In other ducts, provide duct access doors as required to service each item of equipment mounted in the ductwork, including but not limited to-
 1. Fire and combination fire/smoke dampers.
 2. Automatic control dampers.
 3. Coils.
 4. Volume dampers.
 5. Filters.
 6. Controls devices.
- B. Duct access doors shall be complete with latches, gaskets and frames, and shall be constructed in accordance with SMACNA manuals. Provide hinged doors wherever practicable, removable type otherwise. Access doors in lined or insulated ducts shall be insulated.
- C. Furnish access doors as specified in Section 23 01 00 for installation in the general construction wherever duct access doors would not otherwise be accessible.
- D. Access doors shall be generously sized for the purpose intended. Demonstrate suitability of each to the satisfaction of the Architect.

3.6 TESTING:

- A. See Section 23 99 00.

3.7 COMPLETION:

- A. Complete each entire duct system, perform testing and cleaning operations, and leave each system in a condition with the coils cleaned, the filters clean, and debris and foreign material removed from the duct system.
- B. Install a suitable air diffuser, grille, or similar device to cover each duct outlet.
- C. Paint bare metal interior surfaces of ducts which can be seen through air inlets or outlets with a flat black paint.
- D. Operate system and prove them to be free from excessive noise, free from perceptible air leaks, free from vibration, and capable of delivering the air quantities scheduled.
- E. See Section 23 01 00 for additional requirements pertaining to cleaning of exposed ductwork in finished areas and equipment.

END OF SECTION 23 85 00

SECTION 26 01 00 - BASIC ELECTRICAL REQUIREMENTS**PART 1 - GENERAL****1.1 GENERAL:**

- A. All work covered by this section of these specification shall be accomplished in accordance with the respective drawings, information or instructions to bidders, general requirements, and the general conditions of these specifications. Any supplementary conditions, special conditions, addenda, or directives which may be issued by the Architect herewith or otherwise shall be complied with in every respect.
- B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contracts, sub-contracts, or trades as may be issued for bidding purposes only. The complete scope of work for the electrical trade in this project are illustrated on the complete Contract Documents which consist of the combined Architectural, Structural, Plumbing, Heating, Ventilating, and Air Conditioning plans and specifications. Each Bidder shall thoroughly acquaint himself with all the details of the complete set of drawings and specifications before submitting his bid. All drawings and specifications form a part of the contract documents for each separate contract and shall be considered as bound therewith in the event partial sets of plans and specifications are issued for bidding only. The submission of bids shall be deemed evidence of the review and examination of all drawings, specifications, and addenda issued for this project as no allowances will be made because of unfamiliarity with any portion of the complete set of documents.
- C. Connect new work to existing work in neat and approved manner. Restore existing work disturbed to original condition.
- D. Existing systems shall be left in perfect working order upon completion of all new work.
- E. Any equipment which is removed and not reinstalled shall be delivered on site to the Owner, or removed by the Contractor, as directed by the Owner.

1.2 SUB-CONTRACTOR QUALIFICATIONS:

- A. Sub-Contractor (as a company) and his job superintendent for their portion of the work shall have at least three years of satisfactory experience in completion of projects of comparable size and complexity. Evidence of this experience will be required before approval of the Architect as being acceptable for their portion of the work.

1.3 SCHEDULE:

- A. The schedule and sequence of work must be carefully coordinated through the General Contractor, with the Owner, to ensure that all work performed within the existing building will result in a minimal amount of noise, dust and disruption to the activities in the existing building.

- B. All interruptions of existing services must be coordinated through the General Contractor, with the Owner, to minimize inconvenience and disruption to the activities in the existing building. All interrupted services shall be restored as quickly as possible. All interrupted systems shall be thoroughly cleaned and tested prior to being placed back into operation.

1.4 SCOPE:

- A. The work included under this specification consists of the furnishing of all labor, materials, tools, transportation, services, etc., which are applicable and necessary to complete the installation of the systems described in these specifications, illustrated on the accompanying drawings, or as directed by the Architect.
- B. In general, the various lines and raceways to be installed by the various trades under this specification shall be run as indicated, as specified herein, as required by particular conditions at the site, as required to conform to the generally accepted standards and as required by all governing Building Codes so as to complete the work in a neat and satisfactorily workable manner. Run work parallel or perpendicular to the lines of the building unless otherwise noted.
- C. The construction details of the building are illustrated on the Architectural and Structural Drawings. Be thoroughly acquainted with the details before submitting a bid as no allowances will be made because of unfamiliarity with these details. Place all inserts to accommodate the ultimate installation of pipe hangers in the forms before concrete is poured. Set sleeves in place in forms before concrete is poured, and in masonry walls while they are under construction.
- D. The Electrical Contractor shall coordinate with the General Contractor, the requirements of all trades for temporary power during the construction phase. The Electrical Contractor shall provide the installation of temporary power distribution for those requirements as part of his work and at no additional cost to the owner.
- E. The Contractor shall coordinate the interruption of service to the existing building with the Owner and shall bear all costs and be fully responsible for scheduling his work to accommodate all Owner activities at this facility. He shall also provide temporary electrical service to the existing electrical systems as necessary so that the Owner may have the use of undisturbed portions of the existing building.

1.5 INSPECTION OF SITE:

- A. Visit the site, verify all existing items shown on plans, or specified, and be familiar with the working conditions, hazards, existing grades, actual formations, soil conditions, and local requirements involved; submission of bids shall be deemed evidence of such visit. All proposals shall take these existing conditions into consideration and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility.

1.6 UTILITIES, LOCATIONS AND ELEVATIONS:

- A. Locations and elevations of the various utilities included within the scope of this work have been obtained from city and/or other substantially reliable sources and are offered separately from the Contract Documents, as a general guide only, without guarantee as to accuracy.

Examine the site, verify the locations, elevations, and availability of all utilities and services required, and be adequately informed as to their relation to the work; the submission of bids shall be deemed evidence thereof.

1.7 INSTRUCTIONS:

- A. When specified in other Sections, the contractor shall furnish the services of competent instructors who will give full instruction to designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements of the equipment or system specified. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation.
- B. The number of man-days of instruction to be furnished shall be as specified in the various Sections of the Specification.

1.8 CODE REQUIREMENTS:

- A. All work shall comply with the provisions of these specifications, as illustrated on the accompanying drawings, or as directed by the Architect, and shall satisfy the National Electrical Code and all applicable local codes, ordinances, or regulations of the governing bodies, and all authorities having jurisdiction over the work, or services thereto. In all cases where alterations to, or deviations from, the drawings and specifications are required by the authority having jurisdiction, report the same in writing to the Architect and secure his approval before proceeding. Upon completion of the work, furnish a statement from the inspecting authority stating that the installation has been accepted and approved. Provide complete utility service connections as directed, and submit, as required, all necessary drawings; secure all permits and inspections necessary in connection with the work, and pay all legal fees on account thereof. In the absence of other applicable local codes, acceptable to the Architect, the National Electric Code shall apply to this work.

1.9 MATERIALS AND WORKMANSHIP:

- A. All materials unless otherwise specified shall be new, free from any defects, and of the best quality of their respective kinds. All like materials used shall be of the same manufacture, model, and quality unless otherwise specified.
- B. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, adjusted, and conditioned as recommended by the manufacturers, or as indicated in their published literature unless specifically herein specified to the contrary.
- C. All work shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials, and the temporary plugging of open conduits during construction. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.

1.10 COOPERATION:

- A. All work under these specifications shall be accomplished in conjunction with other trades on this project in a manner which will allow each trade to complete his work in a timely fashion.
- B. Maintaining contact and being familiar with the progress of the general construction and timely installation shall be the responsibility of this trade to expedite this contract and avoid unnecessary delays in the progress of other trades.
- C. Should any question arise between the trades as to the placing of lines, ducts, conduits, fixtures, or equipment, or should it appear desirable to remove any general construction which would affect the appearance or strength of the structure, reference shall be made to the Architect for instructions.

1.11 DRAWINGS AND SPECIFICATIONS:

- A. The drawings show diagrammatically the locations of the various conduits, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building and in cooperation with other trades and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make reasonable change in the location of this work without additional cost to the Owner.
- B. Should any changes be deemed necessary in items shown on the contract drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.
- C. Lay out all work maintaining all lines, grades, and dimensions according to these drawings with due consideration for other trades and verify all dimensions at the site prior to any fabrication or installation; should any conflict develop or installation be impractical, the Architect shall be notified before any installation or fabrication and the existing conditions shall be investigated and proper changes effected without any additional cost.
- D. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of material and/or work.

1.12 ARCHITECT'S APPROVAL:

- A. In the statement under this contract where "approval" is required or requested, it is understood that such approval must be obtained from the Architect in writing before proceeding with the proposal, and an adequate number of copies of any such proposal shall be submitted to the Architect.
- B. The approval of the Architect of any material, changes, drawings, etc., submitted will be considered as general only and to aid the Contractor in expediting his work. Such approval as

may be given does not in any way relieve the Contractor from the necessity of furnishing all materials and performing all work as required by the Drawings and Specifications.

1.13 LOCAL RESTRICTIONS:

- A. Contractor shall become familiar with rules and regulations of the City, County, and State; or any other authority having jurisdiction over this project; and if, in his opinion, any work or materials shown on the drawings or specified do not comply with these rules and regulations as to size, type, capacity, and quality, he should make it known to the Architect prior to the submission of his bid.

1.14 ELECTRIC WIRING:

- A. Except for such items as are normally wired up at the point of manufacture and so delivered, and unless specifically noted to the contrary herein, the Electrical Contractor shall do all electric wiring for power supply, including contactors, starters, etc. The other Contractors will erect all motors in place ready for connections. The Electrical Contractor shall mount all starters, as directed, furnishing supporting structures where necessary. The other Contractors will furnish with each item requiring electrical connections, the necessary instructions and wiring diagrams to this Sub-Contractor.

1.15 RESPONSIBILITY:

- A. This Contractor will be held responsible for the satisfactory and complete execution of all work specified or indicated. He shall produce complete finished operating systems and provide all incidental items required as part of this work, regardless of whether such item is particularly specified or indicated.

1.16 HANGERS AND INSERTS:

- A. All hangers, brackets, clamps, etc., shall be of standard weight steel. Perforated strap hangers shall not be used in any work. When two (2) or more conduits are run parallel, they may be supported on trapeze hangers. Other hangers shall be constructed with rods and hanger adjusters of adequate size to carry the loads imposed.
- B. Unless otherwise shown on the drawings, all horizontal runs of conduit and piping shall be suspended from the floor or roof construction, as the case may be, by means of approved hangers spaced not farther apart than ten feet (10') on centers, except that hangers for piping 1-1/4" in size and smaller shall not be spaced more the 8 feet on centers. Vertical risers shall be supported by approved riser clamps or supports installed at the respective floor lines.
- C. Supports and hangers shall be installed to permit free expansion and contraction in the raceway systems. Where necessary to control expansion and contraction, the raceways shall be guided and firmly anchored; anchors shall be approved by the Architect and shall be designed for equal effectiveness for both longitudinal and transverse thrust. No conduit shall be self-supporting, nor shall it be supported from equipment connections. Transmission of vibrations, noise, etc.,

shall be considered and any special suspension with vibration dampers to minimize transmission shall be used where necessary.

- D. Where ducts interfere with the proper location of hangers, furnish and install trapeze hangers. Trapeze hangers may be used to support groups of conduit run parallel.
- E. Above roof - Support conduit at no more than 8 feet on center, with manufactured pipe supports: Miro Industries Model 3-R to match existing supports on roof. The conduit supports shall be a roller-bearing type designed to support piping or conduit, and to absorb thermal expansion and contraction of piping or conduit thus preventing damage to roof membrane. The pipe or conduit shall rest on a polycarbonate resin roller and a glass- filled nylon rod situated in a polycarbonate resin seat.

1.17 GUARANTEE:

- A. The entire system shall be guaranteed to be complete and installed in accordance with these plans and specifications.
- B. Guarantee all new materials and workmanship for a period of one year from and after date of acceptance of installation. Replace, during the period of the guarantee, any parts found to be defective in their operation, without cost to the Owner.
- C. Incandescent lamps shall be excepted from requirements of this guarantee, but all electric discharge and quartz lamps shall be covered under the guarantee.

1.18 REFERENCE ABBREVIATIONS:

- A. References are made in the various electrical sections to technical societies, codes, specifications, trade organizations, and regulatory authorities in accordance with the following abbreviations:
 - 1. FM - Factory Mutual
 - 2. FS - Federal Specification
 - 3. IEEE - Institute of Electrical and Electronics Engineers.
 - 4. IPCEA - Insulated Power Cable Engineers Association
 - 5. IRI - Industrial Risk Insurors
 - 6. ISO - Insurance Services Organization
 - 7. NEC - National Electrical Code(NFPA Pamphlet No. 70)
 - 8. NEMA - National Electrical Manufacturer's Association
 - 9. NFC - National Fire Codes
 - 10. NFPA - National Fire Protection Association
 - 11. UL - Underwriters Laboratories, Inc.

1.19 SHOP DRAWINGS AND DATA TO BE SUBMITTED:

- A. SUBMITTALS WHICH DO NOT MEET THE FOLLOWING REQUIREMENTS WILL BE IMMEDIATELY REJECTED WITHOUT FURTHER REVIEW!

1. Catalog cutsheets and brochures will be preceded by a neatly arranged cover sheet having ample room for shopdrawing stamps and bearing the following information in a prominent, immediately visible location and size:
 - a. Equipment name or number as referenced in the contract Documents (example: "AHU-A" or "Type A" light fixture).
 - b. All options or accessories provided.
 - c. Applicable Specification section and paragraph numbers.

2. Substitutions -
 - a. Cross reference individual manufacturer and catalog numbers of substitute products to those of specified material.
 - b. Prior to requesting permission to use substitute or alternate products, the Contractor shall investigate and make certain that the product-
 - 1) Conforms with the standard of performance and quality specified.
 - 2) Will physically fit in the space allocated, with sufficient access and maintenance space.
 - 3) Involves no additional costs to the Owner or extended construction time.
 - c. Should the use of a substitute product entail any changes in details or construction, the changes and information documenting the complete coordination with all affected trades shall be submitted prior to submittal of substitute or alternate products
 - d. Provide with requests for permission to use substitute or alternate products, drawings, specifications, samples, performance data and other information as may be required to assist in determination of acceptability of the product. The burden of proof is the Contractor's responsibility.

3. All similar or related items shall be submitted together under one cover sheet (i.e. fixtures, raceways, wiring, equipment). Do not piece-meal submittals!!!

B. Submittal Items:

1. Submit manufacturer's certified data relative to equipment required for the installation of the electrical and electronic systems.
2. Submit adequate engineering data on each piece of equipment to allow a careful check of compliance with the technical requirements of the Contract Documents. Clearly indicate on submittal data the manufacturer's name, piece number, equipment capacity, and other applicable technical data.
3. Equipment, Electrical Systems Submittals:
 - a. New Power Distribution Equipment.
 - b. Wiring Devices and Cover Plates.
 - c. Lighting Fixtures.
 - d. Fire Alarm Systems.
 - e. Other Special Systems.

1.20 OPERATING AND MAINTENANCE MANUALS:

- A. Bind in looseleaf binders with the words, "Operating and Maintenance Manual" and the Project identification imprinted on the cover. Prepare three complete sets of records for the Owner, with table of contents, index, and tabbed Section dividers.
- B. During the construction period, accumulate the following for inclusion in the Operating and Maintenance Manuals-
 - 1. Copies or warranties and guarantees on each piece of equipment installed.
 - 2. Fixture brochures.
 - 3. Wiring and Control Diagrams.
 - 4. Approved Shop Drawings.
 - 5. Operating instructions.
 - 6. Recommended maintenance procedures.
 - 7. Lists of major items of equipment with name, address, and telephone number of each local representative.
- C. Submit the manuals for approval at approximately 75 percent job completion.

1.21 RECORD DRAWINGS:

- A. Accumulate Record Drawings during the construction of the Project. Keep one set of blue-line Contract Drawings at the job site at all times, and mark changes, rerouting or modifications which occur, clearly on the Drawings with dimensions.
- B. At completion of the job, deliver Record Drawings to Architect. Record Drawings shall be submitted for approval prior to final payment.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer's names and catalog numbers are scheduled or specified for the purpose of establishing standard of design, quality, appearance, performance and serviceability, and not to limit competition. Scheduled products (as may be modified by detailed specifications) are those selected as the basis for system design with respect to physical size and space arrangements, required capacity and performance characteristics, and the product quality intended.
- B. The Drawings indicate specified products physically arranged in the spaces, as cataloged by specific manufacturers, generally as listed in the Equipment Schedules.
- C. Listed "Acceptable Manufacturer's" are those considered capable of manufacturing products conforming to detailed Specifications, and as such, are invited to compete on an equal basis provided the offering is comparable in every respect to scheduled or specified products and actually conforms to the detailed Specifications and Schedule requirements. Listing herein as "acceptable manufacturers" does not imply "accepted", "approved", or "prior approval", or any other such connotation.

- D. Vendors are invited to submit material or equipment bids to bidding Contractors on any comparable equivalent product, whether or not the manufacturer of such product is listed herein as an "acceptable manufacturer". Such product bids should clearly indicate offerings that are not listed as "acceptable manufacturer's". In the event a bidding Contractor, after satisfying himself that such unlisted product is in fact "equal" to the specified product with respect to design, quality, performance and arrangement (space requirements), and the Contractor desires to furnish that product on the Project, he may request the name of the manufacturer be added to the list of acceptable manufacturers by addendum prior to bid time.
- E. At a bidder's request, an unnamed manufacturer's equipment will be considered to determine additional "acceptable manufacturers" if a request is made in writing no later than ten days prior to the bid opening. If such requests are found acceptable, an addendum will be written listing additional acceptable manufacturers. Consideration will be given only to requests of bona fide bidders (Contractors), not to those received from vendors.
- F. Manufacturers of materials and equipment shall be as specified, scheduled, or as listed in each respective product Specification Article.

2.2 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS:

- A. Materials and adhesives used throughout the electrical systems shall have a flame spread rating not over 25 without evidence of continued combustion and with a smoke developed rating not higher than 50. If such materials are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not higher than 50. (Note: materials need not meet these requirements where they are entirely located outside of a building and do not penetrate a wall or roof, and do not create an exposure hazard or where specifically exempted in the body of these Specifications).
- B. "Flame Spread Rating" and "Smoke Developed Rating" shall be as determined by the "Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E84, Underwriters Laboratories, Inc., Standard". Such materials are listed in the Underwriters Laboratories, Inc. "Building Materials List" under the heading "Hazard Classification (Fire)".

2.3 SLEEVES AND ESCUTCHEONS:

- A. Generally, where conduits pass through walls or floors, 22 gauge galvanized sheet iron sleeves shall be used, except those in beams, outside walls, or structural walls or members which shall be standard galvanized steel pipe. The size of these sleeves shall be such as to permit readily the subsequent insertion of conduit of the proper size with adequate clearance for movement due to expansion and contraction. Where conduits pass through outside walls, the inside diameter of the galvanized iron pipe sleeves shall be at least 1/2" greater than the outside diameter of the service pipe. After the conduits are installed, fill the annular space between the conduit and its sleeve with a mastic or caulk with lead. Use packing as required to accomplish this.
- B. Sleeves in existing masonry load bearing walls shall be schedule 40 steel pipe grouted in place with structural grout. For exterior walls, the space between the pipe and the sleeves shall be packed with oakum or jute twine and calked watertight.

- C. Escutcheons, except as specifically noted or specified, shall be installed on all conduits passing exposed through the floors, walls, or ceilings. Escutcheons shall be equal to the Crane No. 10 chrome plated sectional floor and ceiling plates and shall fit snugly and neatly around conduit. Solid chrome plates with set screws shall be used if sectional plates do not fit properly or stay in place.

2.4 FIRE STOPPING:

- A. Seal annular spaces between sleeves and penetrating materials in fire rated floors, ceilings, and walls with fireproof and waterproof silicone elastomer applied in accordance with the manufacturer's published instructions. Multiple penetrations shall be sealed with silicone caulking. Seal material shall be UL classified for use in fire rated penetration seals, and shall be applied in the manufacturer's recommended thickness for the fire rating of the penetrated structure in accordance with ASTM-E-814 requirements.
- B. Acceptable Manufacturers - Dow Corning, General Electric, Hilti.

2.5 WATERPROOFING:

- A. Seal penetrations of wet or potentially wet structures, floors, exterior walls, etc., other than those requiring fire stopping, with sealant to prevent moisture leakage. Apply sealing material (caulking) in accordance with manufacturer's published instructions.
- B. Product Research and Chemical Co. "Poly-Sulphide Sealant" PRC- 5000.

2.6 FUSES:

- A. Provide fuses for overcurrent protection in fusible devices. Fuses shall be sized in accordance with NEC for equipment actually furnished to the project.
 - 1. Provide Class RK1 time delay fuses for service entrance circuits 0-600 amperes.
 - 2. Provide Class RK1 time delay or Class J time delay fuses for motors, transformers, feeder circuits, and other circuits not specified below, 0-600 amps.
 - 3. Provide Class RK1 time delay or Class J time delay fuses for lighting loads, 0-600 amps:
 - a. For fluorescent ballasts - Type GLR
 - b. For other ballasts and control circuits - Class CC or ATM-R.
 - 4. Provide Class L fuses for all applications, 601 amps and larger.

2.7 CABINETS:

- A. Provide cabinets where indicated and where necessary.
- B. Provide flush type in finished areas centered in paneling and other Architectural features.

- C. Provide surface type in equipment rooms, above accessible finished ceilings, and in crawl spaces.
- D. Install lighting and power cabinets with tops 6 feet 6 inches above finished floor.
- E. Cabinets for Panelboards shall be of same manufacturer as panelboard interiors. Cabinets for timeclocks, contactors and other electrical equipment supplied under this division may be of other manufactures complying with NEMA, UL and nec requirements. All boxes shall be code gauge steel, welded with edges turned to receive trim, and galvanized. Trim and doors shall be No. 12 gauge steel minimum, hinged door, flush tumbler lock and catch keyed alike throughout the work, factory enamel finish, suitable for field color coat. For flush panels provide covers with overlap minimum 3/4 inches top, bottom, and sides. For surface mounted panels covers shall be same size as cabinet.
- F. Identify all cabinets for all panelboards, switchboards, disconnect switches, transformers, motor starters, and electrical equipment furnished shall be provided with engraved phenolic lamacoid plastic name plates with 1/2 inch block engraving. Name plates shall give equipment designation as scheduled on the drawings and voltage and phase of service.

2.8 GROUNDING:

- A. Provide grounding of electrical system in accordance with the National Electrical Code NFPA 70, UL 467, and IEEE 837 for grounding and bonding materials and equipment.
 - 1. Equipment grounding conductors shall be sized in accordance with the National Electrical Code Equipment Grounding Conductor Table on the basis of the circuit overcurrent protection device rating.
 - 2. Bond together the following items to serve as a single grounding electrode for all electric services:
 - a. Minimum 20 feet BHD copper conductor encased in concrete footing or grade beam in contact with earth.
 - b. Structural steel building framework.
 - c. 10'-0" X 3/4" diameter copper-clad steel ground rod(s).
 - 1) Where more than one ground rod is required to meet specified resistance, ground rods shall be located at least 10 feet apart. Interconnect with grounding electrode conductor below grade unless otherwise indicated.
 - d. Metal underground water pipe.
 - 3. The grounding electrode shall be connected by a grounding electrode conductor sized in accordance with the National Electric Code Table 250-94 to the service neutral bus.
 - 4. Provide a main bonding jumper from the grounded service neutral bus to the main equipment ground bus or point of termination of the equipment grounding conductors.
 - 5. Provide bonding jumpers for attachment of each metallic water, fuel, fire suppression, steam, gas or air piping system to the building grounding electrode system. Provide connections with listed connectors applied to the piping in an approved method. The points of attachment of the bonding jumpers shall be accessible. The bonding jumper size shall match the main grounding electrode conductor.

6. Grounding system resistance must not exceed 5 ohms. Final tests shall be conducted to ensure that this requirement is met.
- B. Provide equipment grounding conductors for all circuits. A green insulated, copper ground conductor shall be installed with all circuits so as to make an electrically continuous ground system.
- C. Ground all non-current carrying equipment, such as cable tray and equipment structures.
- D. Grounding Connectors:
1. Listed and labeled by a NRTL acceptable to the authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
 2. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
 3. Welded Connections:
 - a. Exothermic welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
 - b. For structural steel, steel grounding stud for compression connector.
 4. Compression Connectors: Hydraulic crimped, irreversible compression type kits. Connectors shall be factory filled with oxide inhibitor. All crimps shall be made with a hydraulic tool that embosses the index number on the outside of the connector. Compression type connections shall be allowed above and below grade where any permanent connection is required.
 5. All splices and grounding electrode connections shall be made with exothermic welds or with hydraulic compression fittings.
- E. Field Quality Control
1. Inspect grounding and bonding system conductors and connections for tightness and proper installation. Inspect compression type connections for proper die index number embossment.
 2. Perform the following testing:
 - a. After installing grounding system, but before permanent electrical circuits have been energized, test for compliance with requirements.
 - b. Test completed grounding system as each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at ground rods. Make tests at ground rods before any conductors are connected.
 - c. Measure ground resistance no fewer than two full days after the last trace of participation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - d. Perform tests for fall-of-potential method according to IEEE 81. Submit test results to the Engineer.
 - e. If resistance to ground exceeds specified values, promptly notify Engineer and include recommendations for reducing ground resistance.

2.9 IDENTIFICATION:

- A. Provide engraved phenolic lamacoid plastic name plates with 1/2 inch block engraving. Name plates shall give equipment designation as scheduled on the drawings.
- B. After balancing branch circuits, provide each breaker panel with a typed directory which identifies specifically the branch circuit loads and location. Use architectural room names and designations found on the Contract Documents.
- C. Provide labels for fused switches indicating equipment served and unit capacity in horse power or full load amperes and the installed fuse rating.

2.10 WIRE AND CABLE:

- A. Provide systems of wires and cables for electric power, signalling, and control.
- B. Materials:
 - 1. Conductors shall be soft drawn annealed, conductivity of 98% pure copper. No. 10 AWG and Smaller: Solid copper. No. 8 AWG and Larger: Stranded copper.
 - 2. Other: Pull Cords - 1/8" nylon. Pulling Compound - Ideal "Yellow 77".
- C. Install Wire Types:
 - 1. THHN/THWN, XHHW for light and power branch circuits and control wiring.
 - 2. THHN/THWN, XHHW for feeders, sub-feeders, motor circuits and high ambient temperature locations.
- D. Consistently color code wiring continuous throughout the work with insulation factory color-coded by pigmentation.
 - 1. 120/208 Volt Systems:
 - a. Phase A - Black
 - b. Phase B - Red
 - c. Phase C - Blue
 - d. Neutral - White
 - e. Ground - Green
 - 2. 277/480 Volt Systems:
 - a. Phase A - Brown
 - b. Phase B - Orange
 - c. Phase C - Yellow
 - d. Neutral - Gray
 - e. Ground - Green
 - 3. Switch legs, travelers, and special systems continuous throughout the work as selected by the Contractor.

4. Where factory colors are not available, code ends of conductors with 1-1/2 inch colored tape.
- E. Circuits of multiple phases passing through enclosures shall have phases grouped to reduce the reactance effect.
- F. Minimum Sizes:
 1. Light and Power Branch Circuits, 15 and 20 amperes OCP:
 - a. Minimum branch circuit: No. 12 AWG
 - b. 120V longer than 80 feet first outlet to panel: No. 10 AWG.
 - c. 120V longer than 120 feet from first outlet to panel: No. 8 AWG
 - d. 277V longer than 130 feet from first outlet to panel: No. 10 AWG.
 - e. 277V longer than 220 feet from first outlet to panel: No. 8 AWG.
 2. All branch circuits shall have dedicated full ampacity neutrals, or shared neutral conductors serving two or three branch circuits shall be sized at 175% of the maximum branch circuit overcurrent device, based on the 75°C ratings in Table 310-16 of the National Electrical Code. Shared neutral conductors shall be considered as current-carrying conductors for the purpose of derating conductor ampacities for installation of more than three current-carrying conductors in a raceway or cable.
 3. Other circuits sized to limit voltage drop per National Electrical Code.
 4. Control Wiring: No. 14 AWG, unless otherwise specified.
- G. Acceptable Manufacturers - American Insulated Wire Corp., Cablec Corp., Cerrowire, Essex, Guardian, Rome Cable, Triangle.

2.11 OUTLET BOXES:

- A. Provide outlet boxes for the installation of wiring devices, lighting fixtures, fire alarm devices and power and control connections. Provide boxes at the terminal of conduit runs to outlets and devices and for installation of conductors as required by the NEC.
- B. Locate switch boxes at locations designated by Architectural Documents when indicated. If Architectural locations are not identified use appropriate locations consistent with schematic indications on Electrical Documents. Where application of switches repeats installation type and relative locations shall be consistent throughout project unless indicated otherwise.
- C. Provide standard manufactured plugs in unused openings of boxes. Provide plaster rings and covers where required by the building structure. Rigidly attach boxes to structure and ceiling supporting members in suspended ceilings to avoid cutting mechanical ceiling members.
- D. Materials: Metallic boxes shall be of welded or one piece cast construction.
 1. Flush Mounted Outlet Boxes: Standard, stamped galvanized steel with factory conduit knockouts, one piece and welded construction.
 2. In dry walls for single and two gang outlet provide 4S and 4D boxes, for 3 or more outlets use masonry boxes.
 3. In block and masonry walls provide masonry boxes of depths required for wall thickness.

4. In ceilings provide 4 inch boxes. Omit covers if standard canopy and device plates entirely cover the ceiling opening.
 5. In exposed work, exterior of the building, in wet locations, and flush in non-waterproofed walls below grade provide FS and FD boxes.
 6. Unless instructed otherwise on drawings, for telephone and data outlets, provide empty flush mounted wall box with 3/4-inch conduit in wall to accessible ceiling space.
 7. See scheduled flush floor boxes on drawings.
- E. Location: Install center of box at heights above finished floor unless other directions are indicated in Contract Documents:
1. Wall Switches: 47 Inches
 2. Convenience Outlets: 18 Inches
 3. Telephone/Data Outlets: 18 Inches
 4. Boxes Indicated Above Counters (CT): 6 Inches above backsplash and trim, unless otherwise indicated.
- F. Do not use through-the-wall and back-to-back boxes.

2.12 WIRING DEVICES:

- A. Samples: Provide two samples of each type and color of wiring device and respective cover plate utilized in the project. Provide other samples upon specific request for typical NEMA devices. Colors of all exposed devices shall be as herein specified, and shall be submitted for final approval by Architect.
- B. Cover Plate and Wiring Device colors:
1. Finished areas: Grey devices with stainless steel cover plates.
 2. Maintenance and equipment rooms: Grey devices and galvanized steel coverplates.
- C. Cover Plates for Telephone and Data Boxes: Blank, brushed stainless steel, unless otherwise noted on plans.
- D. Weatherproof Cover Plates: Corrosion resistant finish metal plate, die cast cover, and gasket.
- E. Cover Plates for Surface Mounted Outlet Boxes: Zinc coated sheet steel rounded edges, same size as outlet box.
- F. Wiring Device Schedule (Based on Leviton Specification Grade) -
1. Standard duplex receptacle - 125V, 20A, NEMA 5-20: #5352.
 2. Special receptacles - type and NEMA configuration as indicated on drawings.
 3. Ground fault circuit interrupting duplex receptacle - 125V, 20A, NEMA 5-20: #6898.
 4. One pole wall toggle switch - 120/277V, 20A: #1221-2.
 5. Two pole wall toggle switch - 120/277V, 20A: #1222-2.
 6. Three-way wall toggle switch - 120/277V, 20A: #1223-2.
 7. Four-way wall toggle switch - 120/277V, 20A: #1224-2.
 8. Special switches - As indicated on plans.
 9. Acceptable Manufacturers - Eagle, Hubbell, Leviton, Pass and Seymour.

2.13 CONDUITS:

- A. Provide a mechanically and electrically complete conduit system.
- B. Rigid Metal Electrical Conduit: Hot-dipped galvanized steel with zinc coated threads and an outer coating of zinc bichromate, complete with one coupling and one end thread protector.
- C. Intermediate Metal Conduit: Hot-dipped galvanized steel, complete with one coupling and one end thread protector.
- D. Electrical Metallic Tubing: Welded, electro-galvanized thin wall steel tubing.
- E. Flexible Metal Electrical Conduit: Hot-dipped galvanized steel strip core with integral copper ground wire on sizes 1-1/4" and smaller.
- F. Liquidtight Flexible Metal Electrical Conduit: Hot-dipped galvanized steel strip core with extruded polyvinyl jacket, O-Z Gedney Type UAG.
- G. Rigid Nonmetallic Electrical Conduit: Schedule 40 heavy wall polyvinylchloride, high impact resistant.
- H. Elbows and Bends:
 - 1. For rigid nonmetallic conduit systems, use rigid metal electrical conduits.
 - 2. For other conduit systems, use same material as the conduit with which they are installed.
 - 3. For all types, size 1-1/4 inch and larger shall be factory manufactured.
- I. Bushings:
 - 1. 1-1/4" and Smaller: Same material as the conduit with which they are installed.
 - 2. 1-1/2" and Larger: Hot-dipped galvanized with thermosetting phenolic insulation, 150 Deg.C., O-Z/Gedney Type "B".
- J. Locknuts:
 - 1. 1-1/2" and Smaller: Zinc plated heavy stock steel, O- Z/Gedney.
 - 2. 2" and Larger: Cadmium plated malleable iron, O-Z/Gedney.
- K. Hubs: Cadmium plated malleable iron, tapered threads, neoprene "O" ring, insulated throat, O-Z/Gedney.
- L. E.M.T. Fittings:
 - 1. Compression Connectors and Couplings: Gland compression type, die cast zinc body, malleable iron nut, insulated throat, O-Z/Gedney, Raco, Red Dot.
 - 2. Set Screw Connectors and Couplings: Die cast zinc body, single set screw for 1/2" - 1" sizes, two set screws for 1 1/4" - 4" sizes, O-Z/Gedney, Raco, Red Dot.
- M. Liquidtight Conduit Connectors: Cadmium plated malleable iron body and nut, cadmium plated steel ferrule, insulated throat, integrally cast external ground lug, O-Z/Gedney Type 4QL.

- N. Seals for Wall and Floor Penetrations: Malleable iron body, oversize sleeve, sealing ring, pressure clamp and rings and sealing grommet, hex head cap screws, O-Z/Gedney Type FSK.
- O. Fire Seals: Heat activated intumescent material, elastomeric sealing ring, socket head cap screws, steel pressure discs and flange, O-Z/Gedney Type CFSF.
- P. Expansion Fittings: Hot-dipped galvanized malleable iron with bonding jumpers.
- Q. Escutcheons: Chrome plated sectional floor and ceiling plates, Crane No. 10.
- R. Accessories: Reducers, bushings, washers, etc., shall be cadmium plated malleable iron on the forms and dimensions best suited for the application.
- S. Size conduits as indicated on the drawings and as required by the NEC for the number and sizes of wires to be drawn into conduit. Do not use conduit sized less than 3/4" unless specified otherwise.
- T. Conceal conduits from view in all areas except mechanical and electrical equipment rooms, attics and crawl spaces.
1. Should it appear necessary to expose any conduit, bring specific information to the attention of the Architect immediately, and rearrange the work to facilitate an approved installation.
 2. Where conduits must be exposed in finished areas, utilize paintable surface mounted vinyl or metal raceways, fittings and boxes equivalent to Wiremold or Hubbell. No exposed circuitry shall be installed in finished spaces without prior approval of Architect.
- U. Installation:
1. Install all conduits at elevations and locations to avoid interference with grading of other work, the structure, finished ceilings, walls. Avoid causing cutting of masonry units.
 2. Install conduits before concrete is placed, and in advance of masonry work. Run conduits imbedded in structural slabs in the middle of the slab below the top and above the bottom reinforcing steel. Maintain a minimum 1-1/2" cover except where penetration is made. Do not install conduit larger than 1" in slabs.
 3. Install conduits through roof in time to be flashed prior to roofing application.
 4. Cap or plug conduits with standard manufactured accessories as soon as the conduits have been permanently installed in place.
 5. Where space conditions prohibit the use of standard ells, elbows, and conduits, use cast ferrous alloy fittings of such forms and dimensions as best required for the application.
 6. Make all conduit joints mechanically tight, electrically continuous, and watertight. Pitch conduits in a manner to avoid creating moisture traps.
 7. Connect and couple E.M.T. with compression or set screw type fittings. Do not use indentor fittings.
 8. Install and neatly rack exposed conduits parallel with and perpendicular to the building walls. Do not install exposed diagonal conduit runs.
 9. Do not run conduits exposed on the roof unless approval is obtained prior to installation.
 10. Do not place conduits in close proximity to equipment, systems, and service lines, such as hot water supply and return lines, which could be detrimental to the conduit and its contents. Maintain a minimum 3" separation, except in crossing, which shall be a minimum 1".

11. Connect motors, equipment containing motors, equipment mounted on an isolated foundation, transformers, and other equipment and devices which are subject to vibration and which require adjustment with flexible metallic conduit from the device to the conduit serving it. Size the flexible conduit length more than 12 diameters, but less than 18 diameters. Rigidly support the points of attachment on each side of the connection. Use external bonding jumpers on sizes 1-1/2" and above.
12. Install escutcheons on all exposed conduits passing through interior floors, walls, or ceilings. Install fire seals on all conduits passing through fire rated partitions. Install wall and floor fire seals on all conduits passing through exterior walls and floors, or use standard galvanized steel pipe sleeves; diameters 1/2" greater than the outside diameter of the sleeved conduit and fill the annular space with mastic.
13. Install rigid metal electrical conduit for feeders and sub-feeders, and for all used in damp and wet locations and in hazardous areas.
14. Install electrical metallic tubing for branch circuits concealed in walls and above ceiling for size 2" and smaller.
15. Install rigid non-metallic conduit with manufactured spacers for feeders and branch circuits run underground exterior to the building, or underground and beneath the building, or where specifically noted. Use rigid metal conduit long radius sweeps for offsets and changes in direction. Use rigid metal conduit for risers and where exposed above slab or grade.
16. Install flexible metal conduit where specified above and where permitted by the authorities having jurisdiction for final connections to lighting fixtures which have isolated junction boxes. Use liquid-tight flexible conduit for exterior applications, in damp and wet locations.
17. Install pull cords in all empty raceway systems, tagged with the identification of service intended and location of opposite end.

2.14 ACCESS DOORS:

- A. Furnish, for installation under appropriate Section of the Work, access doors at each point required to provide access to concealed valves, dampers, damper operators, and other devices requiring operation, adjustment, or maintenance.
- B. Shall be 16 gage steel, with mounting straps, concealed hangers, and screwdriver locks, designed for the doors to open 180 degrees, minimum.
- C. Access doors installed in fire walls or partitions shall be UL labeled to maintain surfaces.
- D. Provide prime coat finish for installation in ceilings or painted or unfinished surfaces.
- E. Provide polish chrome plate finish for installation in unpainted finished walls.
- F. Acceptable Manufacturers - Baldwin, Hannon, Josam, Miami, Carey, Milcor, Titus, Wade, Walsh, Zurn.

PART 3 - EXECUTION

3.1 PROTECTION OF EQUIPMENT:

- A. Protect equipment from physical damage and deterioration after it is delivered to the Project, and during the installation period prior to Owner acceptance. Repair scratches, mars, or paint deterioration.

3.2 EQUIPMENT SPACE:

- A. The Drawings indicate specified products physically arranged in the spaces, as cataloged by specific manufacturers, generally as listed in the Equipment Schedule.
- B. Coordinate the exact physical space requirements for equipment and servicing of equipment actually purchased for each item of equipment involved.
- C. Keep horizontal lines as close to ceiling as practicable.
- D. Adhere to Drawings as closely as possible in layout of work.
- E. Vary run of conduits and make offset during progress of work as required to meet structural and other interferences.
- F. Install conduits in furred spaces wherever possible. Run exposed conduits parallel to or at right angles to buildings walls.
- G. Conform to ceiling heights established on architectural construction drawings.

3.3 INTERFERENCES:

- A. Relocate or reroute existing conduit, wiring, or equipment as required to facilitate construction of finished work as planned. Restore surfaces, insulation, and finish to match condition of adjacent work.

3.4 CUTTING AND PATCHING:

- A. Assume costs and responsibility for cutting and patching required to complete the installation. Patching shall be finished to match adjacent surfaces to the satisfaction of the Architect.

3.5 PAINTING AND FINISHING AND CLEANING:

- A. Provide touchup painting of prefinished electrical products.
- B. Surfaces shall be left clean and debris shall be removed.
- C. Clean all light fixture lenses, lamps and reflectors.

3.6 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES:

- A. Electrical outlets and light fixtures may be relocated at the Owner's option to points within 10-feet of their indicated locations, at no additional cost to the Owner, provided the Contractor is notified prior to roughing-in and fabrication.
- B. Only work which must be reperfomed in this connection will be considered extra.

3.7 TESTS AND LOAD BALANCING:

- A. Test all circuits to assure them to be free of grounds. Prove and test energy available at the load side of disconnect switches and the final point of connection to driven equipment. Make all reasonable tests as required by the Architect to provide the integrity of the work and leave the complete electrical installation in first class condition and ready for operation.
- B. Balance the load on each phase when connecting the various branch circuits in each panel board. When all load is turned on and the system is in operation at 100% demand, the initial unbalance shall not exceed 10%.
- C. Furnish at the completion of the job, a final inspection certificate from the local inspecting authority.

3.8 ELECTRICAL DISCONNECTS:

- A. Provide disconnects where indicated and where required by the National Electrical Code. Install within sight of electrified equipment served and provide final connection to equipment served.
- B. Provide switch sizes as required by the National Electrical Code based on the equipment actually furnished under other Divisions or provided by the Owner.
- C. Provide NEMA 1 enclosure indoors, NEMA 3R enclosure exterior, in damp or wet locations and in crawl spaces, flush and surface as specified for outlet boxes.

3.9 EQUIPMENT CONNECTIONS:

- A. Provide wiring for the connection of motors and control equipment and control wiring as indicated on the Electrical Drawings.
 - 1. Equipment installed under Other Sections - wiring shall be extended to the equipment, and proper connections made thereto.
 - 2. Flexible connections of short lengths - shall be provided for equipment subject to vibration or movement and for motorized and compressor equipment. Liquid-tight conduit shall be used in wet locations. A separate ground conductor shall be provided across flexible connections.

3.10 EXCAVATION AND BACKFILLING:

- A. Provide necessary excavating and backfilling for the installation of work specified in this Division. Trenches for underground conduits shall be excavated to required depths as necessary to insure uniform bearing. Care should be taken not to excavate below depth, and any excavation below depth shall be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the raceway and refilled to the raceway grade as specified. After the raceway has been installed, tested, and approved, the trenches shall be backfilled to grade with approved material, in 12 inch layers wetted and compacted to density of adjacent soil. Complete backfill to grade to result in a well compacted trench to 95% compaction by the standard Proctor test. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by the Architect shall be a part of this work.

END OF SECTION 26 01 00

SECTION 26 16 00 - POWER DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. Provide distribution panelboards, branch circuit panelboards, motor control centers, transformers and power factor correction equipment, as scheduled and specified for the electrical distribution system.

1.2 QUALITY ASSURANCE:

- A. Source Quality Control: Tests to meet applicable standards of the following:
 - 1. Underwriters' Laboratories.
 - 2. National Electrical Manufacturer's Association.
 - 3. National Electrical Code.
 - 4. American National Standards Institute.

1.3 SUBMITTALS:

- A. Submit shop drawings in accordance with other Sections. Include layouts showing cabinet dimensions, conduit entrances, electrical ratings, bussing connections, single line diagrams, device locations and ratings, and cable termination provisions.
- B. Certificates:
 - 1. Labels of Underwriters' Laboratories affixed to each item of material.
 - 2. Label of Underwriters' Laboratories approval for service entrance use, where applicable, affixed to material.
- C. See section 26 01 00.

PART 2 - PRODUCTS

2.1 POWER DISTRIBUTION EQUIPMENT:

- A. Circuit Breaker Distribution Panelboard:
 - 1. Equivalent to Square D I-Line, all bussing - copper.
 - 2. 3 phase, 4 wire, solid neutral design with sequence bussing and full capacity neutral unless scheduled otherwise.
 - 3. Provide scheduled bolt-on panelboard circuit breakers, 22,000 Amp., R.M.S. minimum interrupting rating, or as scheduled on drawings.

4. Provide cabinets.
5. Provide feed thru lugs where extension of primary feeders is required.
6. Provide ground bus unless noted otherwise.
7. Provide isolated ground bus where scheduled.

B. Branch Circuit Panelboards:

1. Equivalent to Square D Type NQ and NF, all bussing - copper.
2. Single phase, 3 wire, and 3 phase, 4 wire, solid neutral design with sequence bussing and full capacity neutral.
3. Provide scheduled circuit breakers, minimum 10,000 A.I.C. for 208 volt and 14,000 for 480 volt.
4. Provide feed thru lugs where extension of primary feeders is required.
5. Provide cabinets of NEMA type appropriate for application.
6. Provide isolated ground bus where scheduled.

C. Circuit Breakers:

1. Resettable, quick-make, quick-break, thermal magnetic type, ambient compensated, trip free with separate trip position from on and off positions.
2. Multiple pole breakers with common trip and one operating handle. Do not provide handle ties.
3. 15 and 20 ampere, single pole circuit breakers shall be U.L. listed as switching duty rated.
4. Wire with sequence phasing.
5. Provide circuit breakers of appropriate capacity for all unscheduled circuits.
6. For panelboards rated 600 amperes or greater, provide bolt- on type circuit breakers.
7. Provide U.L listed HACR circuit breakers for compressorized equipment loads where the circuit breaker serves as the final overcurrent protection.
8. Where indicated on the panel schedule, provide panel mounted power supply to provide 24 volts DC switching power for remote controlled circuit breakers.
9. Breakers indicated to be "Remote Controlled":
 - a. Circuit breakers shall be UL Listed and rated 120/ 240Vac (1- and 2-pole) and 240Vac (3-pole) with continuous current ratings as shown on the plans.
 - b. Circuit breakers shall have an overcenter, trip-free, toggle type, quick-make/quick-break mechanical action and positive handle indication. Handle shall have on, off, and tripped positions. In addition, trip indication shall include a trip indicator on the face of the breaker case.
 - c. Multi-pole breakers shall have internal crossbars for common trip operation.
 - d. Circuit breaker contacts shall be open when breaker is in the OFF or "tripped" position regardless of remote signal.
 - e. Interrupting capacity shall be 10,000 rms symmetrical amperes.
 - f. 15A and 20A breakers shall be SWD rated.
 - g. Multipole circuit breakers rated 15-60A shall be UL Listed for HACR applications.
 - h. All circuit breakers shall have contacts suitable for use on HID lighting systems.
 - i. Circuit breakers shall be marked "Remote Controlled" in such a way that the marking is visible with the trim installed.
 - j. Circuit breakers shall have terminals suitable for use with Al/Cu 75°C wire.

- k. Circuit breakers shall be capable of operating for 30,000 operations at rated voltage and current with an 80% lagging power factor.
- l. Remote-control shall be accomplished via a 24Vdc high speed motor with clearing switch that clears the motor circuit upon circuit breaker contact opening or closing.
- m. Motor shall operate no more than 50 milliseconds at rated voltage (24Vdc) $\pm 10\%$ and draw no more than 2A instantaneous. Maintaining the control signal shall have no adverse effect on the breaker.

D. Enclosed Circuit Breakers:

1. Equivalent to Square D LHL, MHL and PJL.
2. 3 phase, 4 wire, solid neutral design with sequence bussing, copper and full capacity neutral unless scheduled otherwise.
3. 65,000 Amp., R.M.S. minimum interrupting rating, or as scheduled on drawings.
4. Provide dual rated lugs for supply and load conductors.
5. Provide cabinets of NEMA type appropriate for application. Outdoor enclosures shall be equipped with factory installed means to padlock door.
6. Weather proof hubs and threaded conduit connections shall be used for outdoor circuitry.
7. Provide ground bus unless noted otherwise.

E. Dry Type Transformers:

1. Two windings of the size and electrical characteristics as scheduled.
2. Guaranteed sound levels shall not exceed ANSI standard decibel levels. Transformers shall be rated at full load in a 40°C ambient with 30°C ultimate hot spot temperature rise allowance, with Class F insulation having a UL 185°C rating limiting system temperature to 115°C on 25 kVA and smaller units, and Class H insulation having a UL 220°C rating limiting system temperature to 150°C on 30 kVA and larger units.
3. The maximum temperature rise of the top of the enclosure shall not exceed 35°C over a 40°C ambient.
4. Transformers rated at 30 kVA and above shall have core and coil assembly completely isolated from enclosure with neoprene rubber pads, and six primary voltage taps rated (4) 2-1/2 percent normal and (2) 2-1/2 percent above normal. Transformers rated at 25 KVA and below shall have four primary voltage taps rated (2) 2-1/2 percent below normal and (2) 2-1/2 percent above normal.
5. Make necessary tap adjustments on transformers to insure that the secondary voltages at the transformer terminals will be as close as possible to 120 volts phase-to-neutral, and 208 volts phase-to-phase, when the building is in normal operation.
6. Transformers shall have heat barriered termination compartment arranged for feeder terminations for side or bottom entrance of flexible metallic raceways.
7. Transformers shall have a bonding jumper installed between the secondary neutral terminal and the metal case and shall include a ground terminal of proper size to receive ground conductor.

F. Acceptable Manufacturers – Eaton, General Electric, Siemens, Square D.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Carefully measure and lay out exact locations of equipment in conference with the Construction Manager.
- B. Assure that equipment may be installed without adversely affecting the integrity and appearance of the building structure and with the clearances required by the National Electrical Code.

3.2 INSTALLATION:

- A. Provide panelboards of the types and ratings scheduled where indicated.
- B. Provide flush and surface mounted types where indicated and scheduled.
 1. Provide multi-section cabinets as required and scheduled; one-piece covers and doors, main and sub-feed lugs as required.
 2. Provide hinged doors with flush tumbler lock and catch, all locks keyed alike.
 3. Provide 3 keys for each panelboard.
- C. Provide supports to the building structure, independent of raceways.
- D. Install tops of panelboard cabinets at 6 feet, 6 inches, above finished floor.
- E. Install panelboards in cabinets, centered in door openings.
- F. Provide Identification:
 1. For Panelboards - Engraved, lamacoid plastic name plate, giving equipment designation.
 2. For Distribution and Branch Circuit Panelboards: - Neatly typewritten circuit directory in cardholder inside panelboard door.
 - a. For Branch Circuit Panelboards: Identify rooms served using room numbers corresponding to those finally established at the project.
 - b. For Distribution Panelboards: Identify the equipment served and give circuit designation.
 - c. For motor starters identify equipment designation as scheduled on the drawings, voltage and phase of service, and the source of power.
- G. Provide Vibration Isolation for Suspended Transformers:
 1. Provide spring hangers, equivalent to Mason Type PC30, 1" deflection, consisting of a rectangular steel box, coil spring, spring cups, neoprene impregnated fabric washer, and steel washer, with an elastomeric element at the top of the box for acoustic isolation. The design shall be such as to prevent metal-to-metal contact between the hanger rod and the top of the hanger box. The elastomeric element shall be designed for approximately 1/4-inch deflection and loaded so that deflection does not exceed 15 percent of the free height of the element.
 2. Install the isolators with the isolator hanger box as close as possible to the structure.
 3. Suspend the isolators from the building structure, never from slab diaphragms between beams.

3.3 FIELD QUALITY CONTROL:

- A. Perform manufacturer's recommended field tests prior to energization.
- B. Provide copies of test results to the Owner's representative.

END OF SECTION 26 16 00

SECTION 26 17 00 - MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.1 SCOPE

- A. Provide disconnect switches for branch circuit, motor circuits, and all items of equipment in conformance with the National Electric Code.

1.2 QUALITY ASSURANCE

- A. Source Quality Control: Tests to meet applicable Underwriters' Laboratories, Inc. Standards, the National Electrical Manufacturer's Association and the National Electrical Code.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with other Sections. Include enclosure dimensions, type, electrical ratings, fuse provision, installation instructions, and name plate nomenclature.
- B. Certificates:
 - 1. Labels of Underwriters' Laboratories, Inc. affixed to each item of materials.
- C. See Section 26 01 00.

1.4 JOB CONDITIONS:

- A. Provide switch sizes as required by the National Electrical Code based on the equipment actually furnished under other Divisions or provided by the Owner.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. For single phase motors under 1/2 horsepower: Equivalent to Square D Class 2510 Fractional Horsepower single phase two pole manual starter with toggle type switch, locking attachment, neon pilot light, thermal overload elements sized per motor name plate rating and NEMA 1 enclosure indoors, NEMA 4 enclosure exterior, in damp or wet locations and in crawl spaces, flush and surface as specified for outlet boxes.

- B. For single and three phase motors, 120, 230, 480 volts, 1/2 to 3 horsepower, requiring manual starters: Equivalent to Square D Class 2510 Integral Horsepower manual starter with toggle type switch, low voltage protection, pilot light, thermal overload elements sized per motor name plate rating with number of poles required for specific application and NEMA 1 enclosure indoors, NEMA 3R enclosure exterior, in damp or wet locations and in crawl spaces, flush and surface as specified for outlet boxes.
- C. For Other 250 Volt Equipment: Equivalent to Square D Class 3130 NEMA Type GD Safety Switches, fusible and non-fusible as required by NEC with cover interlocks, with NEMA cabinet required for application, with threaded hubs.
- D. Acceptable Manufacturers - Cutler Hammer, General Electric, Siemens ITE, Square D.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect building structure to which disconnects are to be secured for defects which affect the execution and quality of work.
- B. Do not start work until defects are corrected.

3.2 PREPARATION

- A. Carefully measure and lay out exact locations maintaining working clearances required by the National Electrical Code.

3.3 INSTALLATION

- A. Provide disconnects where indicated and where required by the National Electrical Code.
- B. Install within sight of equipment served.
- C. Provide final connection to equipment served.
- D. Provide name plate secured to cabinet with designation of equipment served, operating voltage, and circuit designation.

3.4 EQUIPMENT CONNECTIONS

- A. Provide wiring for the connection of motors and control equipment and control wiring as indicated on the Electrical Drawings.

1. Equipment installed under Other Sections - wiring shall be extended to the equipment, and proper connections made thereto.
2. Flexible connections of short lengths - shall be provided for equipment subject to vibration or movement and for motorized and compressor equipment. Liquid-tight conduit shall be used in wet locations. A separate ground conductor shall be provided across flexible connections.
 - a. Length of flexible connections for motors shall be at least 11-inches plus 1/4-inch per horsepower up to 100 hp, and need not be longer than 36-inches unless otherwise indicated.
 - b. Length of flexible connections for transformers shall be at least 11-inches plus 1/4-inch per KVA up to 100 KVA, and need not be longer than 36-inches unless otherwise indicated.
3. Power connections to any vibration isolated equipment shall be made with a length of flexible conduit having a 90 degree bend in it between the junction box on the equipment and any non-flexible conduit.
4. Owner furnished equipment - wiring shall be extended to the equipment, and proper connections made thereto.

END OF SECTION 26 17 00

SECTION 26 51 00 – SITE LIGHTING**PART 1 - GENERAL****1.1 WORK INCLUDED:**

- A. Conditions of the Contract and General Requirements are hereby made a part of this section.
- B. Provide lighting fixtures, lamps, and accessories for exterior site illumination.

1.2 QUALITY ASSURANCE:

- A. Manufacturers: Exceptions to manufacturers listed with each item shall be made in accordance with the General Requirements.
- B. Laboratory Testing: Photometric testing shall be by Independent Testing Laboratories, Inc., based on Illuminating Engineering Society published procedures, and shall include candlepower distribution tabulation and zonal cavity coefficient of utilization tabulation.
- C. Pole Lighting performance shall meet the criteria established for the design of this project. The supplier shall provide calculated performance information in this work. The manufacturer shall supply photometric data for the supplied fixture in a standard IES format so that the calculations for this project may be independently verified.
- D. Standards:
 - 1. All lighting fixtures shall meet Underwriters' Laboratories, Inc., applicable standards.
 - 2. Fixtures shall be provided possessing Underwriters' Laboratories location duty listings as required by the specific application.
 - a. Exposed Outdoors - Wet Location
 - b. Sheltered Outdoors - Damp location
- E. NEC Compliance: Comply with the NEC as applicable to the installation and construction of lighting fixtures.
- F. NEMA Compliance: Comply with applicable requirements of NEMA Standard Pub. Nos. LE-1 and LE-2 pertaining to lighting equipment.
- G. ANSI/UL Compliance: Comply with ANSI/UL Standards pertaining to exterior lighting fixtures.
- H. UL Compliance: Provide light fixtures that have been UL listed and labeled.

1.3 SUBMITTALS:

- A. Submit manufacturer's literature giving materials, finishes, dimensions, coefficients of utilization, and light source types for each fixture which is the product of one of the listed acceptable manufacturers. Include complete shop drawings of the fixture.
- B. Submit samples of fixtures upon specific request.
- C. See Section 26 01 00.
- D. Submit shop drawings for each ground and pole mounted site lighting assembly to include fixture and driver arrangement, maximum EPA per pole, total electrical loads and pole construction details, pole fixture lighting layout showing recommended pole locations, fixture types, aiming points and mounting heights.
 1. Submit IES format photometric data on standard digital data media for the submitted fixtures.
- E. Manufacturer shall submit for approval a computer calculation derived lighting layout showing point by point footcandle levels of the parking and sidewalk surfaces, maximum to minimum ratio and total energy consumption in KW per hour required for proposed layout. Point by point lighting level calculations shall identify maintained horizontal footcandle levels for comparison to the design.
 1. For LED fixtures, calculations to determine the maintained lighting levels shall be based on the following:
 - a. A 0.9 light loss factor.
 - b. Absolute fixture lumens.
 - c. Minimum illuminance for the paved parking and sidewalk areas of 1.0 footcandle.
 2. Submit IES format photometric data on standard digital data media for the submitted fixtures.

1.4 CERTIFICATES:

- A. Labels of Underwriters' Laboratories, Inc.; Certified Ballasts Manufacturers, and Electrical Testing Laboratories affixed to each item of material.

PART 2 - PRODUCTS**2.1 ACCEPTABLE FIXTURE MANUFACTURERS:**

- A. Listed in schedule and with materials.

2.2 POLE LIGHTING FIXTURES:

- A. Luminaire Assembly/Hardware -
 1. Luminaires shall be fully assembled and individually tested prior to shipment.

2. Luminaire housing and door shall be one piece die cast aluminum construction. The housing shall be designed to prevent the buildup of water and debris on the top of the housing. Access to the internal housing and electrical components shall be toolless by use of two recessed stainless steel latches. Door frame shall swing down and be retained by two catch hinges. Drivers and surge module shall be separated from the optical chamber by a cast in wall to allow for cooler operation. Luminaire shall include an extruded aluminum bolt on arm bracket for mounting to round or square poles.
 3. The maximum weight of the luminaire shall be 45 pounds and the maximum effective projected area shall not exceed 1.30 with mounting bracket.
 4. Manufacturers of LED luminaires shall demonstrate a suitable testing program incorporating high heat, high humidity and thermal shock test regimes to ensure system reliability and to substantiate lifetime claims.
 5. The sole use of IESNA LM-80 data to predict luminaire lifetime is not acceptable.
 6. At time of manufacture, electrical and light technical properties shall be recorded for each luminaire. At a minimum, this should include lumen output, CCT, and CRI. Each luminaire shall utilize a unique serial numbering scheme. Technical properties must be made available for a minimum of 5 years after the date of manufacture.
 7. Luminaires shall be provided with a 5 year warranty covering LEDs, drivers, 10kV surge module, paint finish and electrical connectivity.
 8. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver.
 9. Each luminaire shall be rated for a minimum operational life of 50,000 hours at an average operating time of 11.5 hours per night at 40°C (104°F).
 10. The rated luminaire operating temperature range shall be -30°C (-22°F) to +40°C (104°F).
 11. Each luminaire shall be capable of operating above 104° F (40°C), but not expected to comply with photometric requirements at elevated temperatures.
 12. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or approved equivalent standard from a nationally recognized testing laboratory.
 13. Luminaire housing shall be UL wet location listed.
 14. The optical assembly of the luminaire shall be protected against dust and moisture intrusion per the requirements of IP-66 (minimum) to protect the optical components.
 15. Housing and door frame shall be die cast aluminum with a nominal 2.5 mil thick paint finish able to withstand a 3,000 hour salt spray test as specified in ASTM Designation B117.
 16. Each refractor or lens shall be made from UV inhibited high impact optical grade acrylic and be resistant to scratching.
 17. Luminaire shall have a minimum initial efficacy of 84 lumens per watt and shall consume no more than 146 watts. The luminaire shall not consume power in the off state.
- B. LEDs and Drivers:
1. As specified below.
- C. Aluminum or steel lighting poles, as scheduled (base mounted):
- a. All poles with concrete base shall be designed to withstand the bending and overturning moment created by the wind loading of the entire pole and mounted

assemblies (EPA) and eccentricity caused by deflections under design wind loads. The design wind loading shall utilize an 80 MPH wind with a 1.3 gust factor. All portions of concrete pole bases shall be constructed in accordance with other specification sections.

- b. Poles shall be fabricated from aluminum or steel, as scheduled, and shall have an electrical cable passageway through the center. Poles shall receive a baked, electrostatically applied powder paint finish with a primer coat and a finish coat.
- c. Poles shall be provided with base access hole with cover above the pole base.
- d. Lightning protection shall be provided for each pole. A dual rated grounding lug shall be provided at the pole bottom hand hole. This grounding lug shall be electrically and mechanically connected to the pole metal.
- e. Pole accessories:
 - 1) A handhole frame shall be centered above the pole base. Cover in round poles shall be curved.
 - 2) A UL grounding lug shall be bonded to the inside of the pole across from the pole base handhole.
 - 3) Factory installed vibration dampener.
- f. Grounding: A #6 stranded copper ground wire shall be attached to an internal lug and connect a 5/8" x 10' UL listed ground rod unless diagrammed or scheduled otherwise.
- g. Pole Handling and Erection:
 - 1) Transportation, site handling and erection shall be performed by qualified personnel with equipment and methods that are in accordance with standard industry practices.
 - 2) Prior to unloading the pole, shop drawings shall be reviewed to identify proper pick-up points for unloading, storage and erection procedures.
 - 3) Internal wiring may be installed while pole is in horizontal position on the ground.

D. Acceptable Manufacturers:

1. Eaton-Lumark, Hubbell, Lithonia Architectural.

2.3 LEDs AND DRIVERS:

A. LEDs and Thermal Management:

1. Luminaire shall be manufactured with LED's provided by Philips Lumileds, Cree, Nichia or Citizen. LEDs shall have a Correlated Color Temperature (CCT) of 4,000K +/-275K. The color rendition index (CRI) shall be a nominal 70. Binning of the LEDs shall conform to ANSI/G, NEMA SSL 3-2010. Drive current to the LEDs shall not exceed 350mA.
2. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
3. The luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of the whole luminaire.

4. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
5. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
6. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
7. The luminaire shall have a minimum heat sink surface such that the LED manufacturer's maximum junction temperature is not exceeded at the maximum rated operating temperature.
8. The heat sink material shall be aluminum.

B. Drivers:

1. LED Drivers and Surge Supression :
 - a. The driver shall operate from 60 HZ+/-3HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output. Power factor shall be .90 or greater. Total harmonic distortion (current and voltage) induced into the AC power line shall not exceed 20 percent. Drivers must meet Class A emission limits referred in Federal Communications Commission Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise. Drivers shall be an IP66 rated UL class 2 power unit as per UL 1310.
 - b. Surge Suppression: The luminaire on-board circuitry shall include surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaire from damage and failure for common and differential mode transient peak currents up to 10 kA (minimum). SPD conforms to UL 1449. SPD performance has been tested per procedures in ANSI/IEEE C62.41-2:2002 category C high exposure and ANSI C136.2 10kV BIL. The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Inspect drawings and specifications.
- B. Inspect site and existing construction for defects affecting the quality and execution of work.

3.2 PREPARATION:

- A. Layout exact locations of poles and fixtures in accordance with plans, fixture details and supports. Obtain approval from Architect for layout locations.

3.3 LIGHTING POLE INSTALLATION:

- A. Excavation:
 - 1. The Contractor may excavate by any means he prefers, insofar as these methods conform to these specifications.
 - 2. The bottom of the pole base holes shall be on undisturbed earth. If a pole hole is excavated to a depth greater than required, it shall be backfilled with graded crushed rock, placed in 6" layers, and thoroughly machine tamped to density of surrounding soil.
 - 3. The Contractor shall immediately notify the Architect of any abnormal conditions discovered during excavation that may affect the installation.
- B. Plumb poles to vertical.
- C. Provide lighting fixtures, switches, and control systems, and wiring.
- D. Install in accordance with manufacturer's instructions, submittal data, and details on the drawings.

3.4 ADJUSTMENT AND CLEANING:

- A. Adjustment: Adjust internal reflectors and/or lamp positions for desired effects. Align fixtures with layout or building walls.
- B. Cleaning: Remove dirt, grease, and foreign materials from interior and exposed of all fixtures.
- C. Touchup marred finishes with manufacturer supplied paint or coating material to the satisfaction of the Architect. Poles with excessive damage to finish shall be replaced.
- D. The Contractor shall be responsible and bear all costs for remedy of deficient performance or installation.

3.5 LIGHTING FIXTURE SCHEDULE: Refer to drawings for fixture schedule.

END OF SECTION 26 51 00

SECTION 27 88 00 - INTERCOM SYSTEMS**PART 1 - GENERAL****1.1 SCOPE:**

- A. This specification provides the requirements for the installation, programming and configuration of new Intercom headend equipment and clocks. All existing intercom cabling shall remain and be connected to the new call in stations, clocks, speakers, and headend equipment. The system shall include, but not limited to: head end equipment, telephones, annunciators and clocks as shown on the plans, and all other equipment necessary to provide a complete and operating system.
- B. The intercom system shall, as a minimum, incorporate all new devices shown on the plans.
- C. The Communication system shall provide distribution of intercom, overhead paging, emergency paging, class change time tones, emergency tone and program material.
- D. New intercom headend equipment shall be rack mounted in the existing equipment cabinet.
- E. The requirements of Section 26 01 00, Basic Electrical Requirements, apply to this work.

1.2 QUALITY ASSURANCE:

- A. Equipment:
 - 1. Equipment assemblies shall be factory assembled and tested as a complete unit to meet the requirements of this system.
 - 2. All equipment shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.
 - 3. The Manufacturer shall be a nationally recognized company specializing in intercom systems. This organization shall employ factory trained technicians, and shall maintain a service organization within 100 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the intercom systems industry.
 - 4. Manufacturers/model numbers listed herein shall be the basis of design. Equivalent equipment provided by acceptable manufacturers may be submitted for approval.
 - 5. The intercom system shall have a distributed communication architecture.
 - 6. Acceptable Manufacturers: Carehawk, Bogen, Simplex.
- B. Bidders:
 - 1. Bids by Wholesalers, Contractors, Franchised Dealers or any firm whose principal business is not that of manufacturing or installing intercom systems shall not be acceptable.
 - 2. The bidder shall have an in-place support facility with technical staff, spare parts inventory and all necessary test and diagnostic equipment. The installer shall have a resident fully qualified service organization equipped for on-site maintenance and repair within a 100 mile radius of the site.

- C. Installer:
1. The system shall be installed by competent technicians, regularly employed by the intercom manufacturer with full responsibility for proper operation of the intercom system including debugging and proper calibration of each component in the entire system.
 2. Supplier and installer shall be able to refer to similar installations in the immediate area furnished and serviced by him during the past three years, providing satisfactory service.
 3. Contractors unable to comply with the provisions of Qualification of Installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.
 4. Manufacturer's Representative: Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.

1.3 SUBMITTALS:

- A. Shop Drawings: Submit manufacturer's literature completely describing intercom system components, equipment, and accessories, and shop drawings illustrating system interconnecting wiring and connections.
1. The contractor shall include the following information in the equipment submittal:
 - a. Complete wiring diagrams that illustrate the wiring requirements for each component in the proposed system.
 - b. Equipment list of all proposed devices and equipment.
 - c. Manufacturer's catalog data cut sheets on all equipment being provided for a fully functional system.
 - d. Software and firmware as required to provide a complete functioning system.
 - e. FCC registration number.
- B. Instructions: Furnish Instruction Manual describing operation of intercom system.
- C. Documentation:
1. Software documentation including description of programmed operation.
 2. Submit maintenance brochure after completion of the project. Maintenance brochure shall include operating instructions, specifications, and instruction sheets for the equipment.
 3. A complete list identifying all specific deviations from the specified system components and operation.
- D. See Section 26 01 00.

PART 2 - PRODUCTS

2.1 VOICE COMMUNICATION AND SOUND SYSTEM:

- A. Furnish and install a microprocessor controlled voice communication system with all conduit, wire, outlets and equipment as shown on the drawings and as herein specified to provide a complete intercom, program and tone distribution and clock system in the building.
- B. The integrated communication system shall be interfaced with the Owner's telephone system. Provide this work coordinated with the owners' telephone system provider.

2.2 SYSTEM OPERATION AND FEATURES:

- A. The integrated communications system shall be a multi-channel, microprocessor controlled communications system. The system shall be capable of simultaneously handling intercom, program, and paging distribution using administrative telephones APIs connected to the intercom system and from selected telephones connected to the owner's telephone system. The system shall provide the ability to operate and correct digital and/or analog clocks. The system shall provide the ability to distribute tones to different areas of the building and activate other devices or systems based on the time of day, system activity or event. The system shall provide up to two independent intercom channels between administrative telephones and loudspeaker(s). One additional simultaneously operating channel shall be provided for distribution of program material. Systems not providing a minimum of two, simultaneous open voice (administrative telephone to speaker) speech paths shall be unacceptable.
 - 1. System shall provide user programmable architectural room numbering assignments.
 - 2. Calls placed from the call-in switch in the classroom shall display the numeric room number of the classroom placing the call and priority of the call on the administrative telephones connected to the intercom system.
 - 3. System shall contain a minimum of 64 Multipurpose Zones, which can be assigned and programmed as desired between paging, program, or time zones.
 - 4. The system shall allow future expansion of the program channels to a total of two individual channels.
 - 5. The system shall provide integration with the owner provided telephone system that will allow owner provided telephones to handle calls from telephones connected to the owner provided telephone system as well as calls placed from the existing intercom call-in switches.
 - a. Owner provided telephones shall also have the ability to call individual classroom speakers and establish a two way conversation with that classroom and make zone, all call and emergency pages over the intercom system speakers.
 - b. Additional equipment and programming that may be required by the owners telephone system shall be the owners' responsibility.
- B. The system shall be equivalent to the Carehawk CH1000 integrated communications system.
- C. The system shall have the capability for modular capacities of 256 audio ports with associated call-in point.
 - 1. All port locations may be assigned to a 3, 4, 5 or 6 digit dial number as available on industry standard telephone keypad.
 - 2. The system shall be expandable in groups of ports.
- D. The system shall provide a minimum of 25 system tones and 25 user configurable tones.

1. The system shall allow the user shall be able to add 25+ custom WAV files for use as pre-recorded announcements, bells, reminders, pre-announce tones, or any other system tone. Intercom systems not allowing users to add WAV files or do not allow for the use of WAV files for any system tone shall not be considered.
- E. The system shall provide one multiple input source, program distribution channel. This program shall be programmed and distributed from any administrative telephone. Systems that require manually operated switchbanks to distribute program material shall not be acceptable.
- F. The system shall have 64 user assignable groups for zoned audio paging, class change signals, or program distribution, with any speaker belonging to all zones, some zones or no zone.
 1. Paging may originate from any administrative telephone, telephone on the owners telephone system or a dedicated paging microphone (if provided), or program source input.
 2. System software shall allow loudspeakers in the immediate vicinity of the administrative telephone making the page to be excluded from that page to prevent feedback.
 3. An administrative telephone may be associated directly with a loudspeaker by assigning them the same dial number
 4. The system shall include Page or Intercom priority over class change tones and pre-programmed events.
 - a. Class change tones occurring simultaneously with All Page or Zone Page shall be programmable to be delayed until the active page has concluded.
 5. The system shall utilize the industry standard 25V method of transmission.
 6. Each loudspeaker may be a member of up to 64 multipurpose zones.
- G. The system shall provide up to two simultaneously operating open voice intercom channels between administrative telephones and classroom speakers.
 1. Communications from the classroom loudspeaker shall be hands free. The staff member in the classroom need not operate any buttons to reply to a call. The system shall use the automatic VOX operation to switch between the talk and listen modes.
- H. All audio functions in the system operate within the following priority scheme.
 1. A Lower priority function cannot interrupt a higher priority event.
 2. A Lower priority event may be interrupted by a higher priority event.
 3. Interrupted lower priority functions (automatic) will be restored after conclusion of the higher priority function.
 - a. If an event is initiated while a Page is occurring, the event will be optionally delayed until the Page is complete.
 4. The following priorities are ranked from highest to lowest.
 - a. An emergency page suspends all other audio
 - b. An emergency tone suspends all other audio except the above
 - c. A normal page suspends all other audio except the above
 - d. A tone suspends all other audio except the above
 - e. A program source audio event suspends nothing
 - f. Interrupted lower priority functions shall be restored after conclusion of the higher priority function.

5. A group of loudspeakers may be temporarily excluded from receiving Time, Page or Program distribution by temporarily removing the desired station(s) stations from a pre-programmed zone. This feature shall be enabled/disabled from any administrative telephone programmed to allow access to this function.
 6. The initiator may cancel this exclusion at any time.
 7. A temporary exclusion shall automatically return to the pre-programmed status before the start of class the next day.
 8. A group of loudspeakers may at the users discretion be permanently excluded.
- I. The system shall contain a flexible database capable of addressing each system loudspeaker and call-in switch and assigning unique parameters to each.
1. System programming shall be via a PC.
 - a. The user may choose to perform these programming functions via an already installed PC on-site or remotely from off-site.
 - b. Off-site programming and diagnostics shall be accomplished via the internet.
 - 1) Provide owner with an electronic copy of; bell schedule, architectural room number information, zone assignments for paging and current bell schedules, dial numbers for all administrative telephones. Access to this information shall be from a standard PC with Windows version 7 or higher.
- J. The system shall contain an integral master clock which shall be capable of performing the following functions.
1. Provide unlimited discrete time event entries and unlimited schedules for programming functions based upon;
 - a. The time of day in hours and minutes.
 - b. The date the event is to occur.
 - c. Selection of any one or any combination of sixty-four zones to be activated.
 - d. Selection of any one or combination of outputs to be activated.
 - e. Selection of any one or combination of an unlimited number of schedules to allow for maximum flexibility due to special circumstances or seasonal changes.
 - 1) Any combination of an unlimited number of time schedules may be active simultaneously.
 - f. Time tone event type.
 2. The system shall provide twenty-five (25) system time tone types and allow users to add up to twenty-five (25) WAV files to be used as event tones.
 3. The master clock shall provide for automatic daylight savings time and leap year adjustments.
 4. The master clock shall provide the ability to interface with an external master clock to allow the two systems to synchronize.
 5. Master clock shall correct compatible secondary clocks, analog or digital or both.
 6. The system shall include calendar based software that allows the user to create, edit and review an unlimited number of events and schedules. Intercom systems that provide scheduling of events by only the day of the week and not on a calendar basis shall not be considered.

7. The system shall support "March to Music" allowing pre-selected program material to be distributed according to pre-programmed schedules.
 8. The intercom system master clock shall be capable of being synchronized by a Network Time Server (NTP). Intercom systems that do not synchronize to a NTP server shall not be considered.
- K. The system shall provide, as a part of the processor card, five open collectors, three dry contacts, and six general purpose inputs for interface with external devices and/or systems. Systems not providing these inputs and outputs shall be unacceptable.
1. Inputs shall be programmable by the user to initiate any desired system activity (e.g. page, tone, program, event, system reset, clock synchronization, alarm etc.)
 2. Outputs shall be programmable by user to activate during any desired system activity (e.g. intercom, page, tone, program, time of day, etc.). Outputs may also be manually activated from any administrative phone.
- L. The system shall contain self-diagnostics to continually monitor the systems integrity. The system shall be provided with a user-friendly interface for system programming and diagnostics. The GUI will be Windows® based and will run on any compatible PC that supports Windows®.
1. User or Service Technician may download or upload complete system configuration data and store on a diskette. All system programming shall be stored on the disk for future use. This information may be reloaded at any time either on-site or from a remote location.
 2. A copy of the programming and diagnostic software shall be provided to the owner and installed on the Owner's PC as part of this contract.

2.3 SYSTEM EQUIPMENT:

- A. ADMINISTRATIVE TELEPHONE (AP1)
1. The AP1 shall be desk mounted and contain a matching telephone handset with retractable-coiled cord and conductive rubber button switches, with clearly designated touch points. The housing shall be constructed of high impact flame retardant beige plastic. Features shall include:
 - a. Desk & wall mountable
 - b. 128 x 240 LCD graphic display with 14 lines by 16 characters
 - c. Backlight shall turn red to indicate emergency communications
 - d. Real-time status line icons display the current status of the CH1000
 - e. Built-in memory allows for 40 user commands stored in a visual directory
 - f. Easy to use dynamic wizard-based menu system with soft keys
 - g. 9 custom speed dials
 - h. Built-in speaker phone for hands-free VOX-based communication
 - i. Independent volume control for handset, speaker and ring
 - j. One-touch emergency page
 - k. Built-in diagnostics
 2. AP1 Functions: The system shall provide the following functions and features:
 - a. User-programmable architectural room number assignment: three, four, five or six digit alpha/numeric, direct dialing number assignment. Any ATEL can direct dial any other AP1 telephone, loudspeaker, or group of loudspeakers.

- b. The API shall provide two modes of communication to classroom loudspeakers. Communications shall be via handset or microphone-speaker, activated by a built-in talk/listen switch.
- c. Answering calls from classroom locations shall be accomplished by picking up the handset or depressing the SPKR-PHONE button.
- d. Call-in from APIs or classroom call-in buttons shall be displayed in the following manner:
 - 1) The first call entered shall appear in the display window of the responsible API(s), which shall display the dial number of the calling station.
 - 2) Any number of calls shall be stored in memory, up to the total capacity of the system with the quantity of those calls waiting displayed at the ATEL.
 - 3) NORMAL and lower level calls shall annunciate with slower, repetitive rate, audio tone than EMERGENCY calls. Calls shall sort and stack automatically according to the pre-programmed priority level assignments. Each incoming call shall be automatically registered first in order of priority and then by order placed.
 - 4) Calls that have been upgraded by the caller shall automatically move to the EMERGENCY level and appear in proper sequence.
 - 5) Emergency calls are distinguishable from normal calls by designation and unique tone pattern. Attendant may visually or audibly determine whether the call-in from a classroom is an emergency or normal call-in.
 - 6) An API shall have the ability to forward its call-in coverage to another API(s). This may be a manual operation or at a pre-determined time shall be automatically forwarded. All functions such as ALL PAGE, ZONE PAGE, and other programmed functions shall be available to all APIs.
 - 7) It shall be possible to manually activate and sound the time tone event signal to any of the sixty-four(64) multi-purpose zones from any API.
 - 8) A "PROGRAM" button shall be provided on each API for selection and distribution of each of the program channels to classroom and other loudspeakers. Systems that require operating groups of manual toggle switches shall not be acceptable.
 - a) The program channels shall be distributed via the ATEL to a room or rooms, corridor loudspeakers, paging zones, or all rooms.
 - b) Changes to the distribution of the programs may be initiated while program distribution is already in progress, without having to first defeat the current distribution.

B. SECURITY SWITCHING CARD

1. The intercom system shall use distributed security switching cards for connection to all system speakers and call-in switches.
2. Security switching cards shall be centrally powered from the intercom system central cabinet at distances up to 2700 feet using a single cat 5e cable.
3. Security switching cards shall provide RJ45 terminations for field wiring.
4. Security switching cards shall contain 16 or 32 audio ports
5. Each audio port shall support bidirectional audio communications with the central cabinet and API administrative telephone(s) as well as multiple contact closure inputs.
6. Security switching cards shall be equivalent to Carehawk model SS16 (16 port) or Carehawk model SS32 (32 port)

7. Intercom systems that do not use a distributed architecture or require networking of multiple central systems to be distributed shall not be considered. Intercom systems that require the use of Ethernet components to bridge the 2700 foot distance shall not be considered.

C. AMPLIFIERS

1. The intercom system amplifier shall be equivalent to Carehawk DAF250 Class D digital amplifier with at least 250 Watts RMS and 300 Watts peak output. Amplifier distortion shall not exceed 0.2% at 90% load. Intercom systems using Class B amplifiers or amplifiers not capable of 0.2% maximum distortion shall not be considered.
2. The Class D amplifier shall be direct drive 25V constant voltage type. Intercom systems using transformer based amplifiers shall not be considered.
3. The intercom system shall filter all voice signals through a Digital Signal Processor (DSP) to maximize voice intelligibility. Intercom systems not using a DSP shall not be considered.
4. The intercom system shall have 45 Ohm conversion modules available on a switching/line cards basis to convert the 25V audio signal to 45 Ohm for use with 45 Ohm speakers. Intercom systems not capable of conversion to 45 Ohm audio on a switching/line card basis shall not be considered.
5. The intercom system amplifiers shall go to sleep thus reducing their current draw when not in use. Intercom systems that use amplifiers that do not reduce their current draw when not in use shall not be considered.
6. The intercom system amplifiers shall have a built in pink noise generator for testing speaker quality and audio levels. Intercom systems that do not contain a pink noise generator shall not be considered.

D. LOUDSPEAKERS, BAFFLES AND BACKBOXES

1. Flush Mounted Ceiling Speakers.
 - a. The loudspeaker shall be a dual cone 8-inch speaker shall be equivalent to Lowell Model No. 810-T72 which shall be of the permanent magnet type having a seamless molded fiber cone with a hard fiber whizzer cone mechanically coupled to a voice coil for extended high frequency response. Power rating shall be 15 watts RMS. The voice coil shall have a 1-in. dia. and shall operate in a magnetic field derived from a strontium ferrite (ceramic) magnet having a nominal weight of 10 oz. Voice coil impedance shall be 8ohms. The mounted transformer shall be 70/25V dual voltage with selectable taps at .25, .5, 1, 2, and 5W. The assembly shall be capable of producing a uniform audible frequency response over the range of 51Hz-11.6kHz (+6dB), 50Hz- 20kHz (+6.4dB) with dispersion angle of 95 degrees conical @2000Hz (-6dB).
 - b. The loudspeaker baffle shall be equivalent to Lowell Model WB-8. It shall be fabricated one-piece 20-gauge steel reinforced with a peripheral flange of 60-degrees. The grille diameter shall be 12.875" with a shallow mounting projection of 0.25". Each grille shall have four 0.25" holes spaced at 90-degree intervals on an 11.25" bolt circle for mounting grille to specified backbox or mounting ring. It shall be finished in white powder epoxy coating and include white screws for backbox mounting and welded studs for mounting specified 8" speaker.
 - c. The enclosure for recessed installation of an 8 in. driver shall be equivalent to Lowell Model No. 8XD4, which shall be fabricated of certified U.S. steel and have a white powder epoxy finish. The unit shall have a diameter of 10 inches and a

depth of 4 inches. It shall include a polyurethane foam disc that is UL Listed to meet flammability CAL-117 for resonance and vibration control. The enclosure shall also feature one planished (0.5 in.) knockout on top and four (0.5 to 0.75 in.) knockouts on sides (spaced at a 90-degree interval).

2. Surface Mount Speakers

a. The surface-mount backbox shall be equivalent to Lowell Model CB84-SG, which shall be fabricated of 20-gauge steel and lined with 1.5" acoustic batting. The rear shall include provisions to mount a 4" square, 4" octagon, 2-gang or 1-gang E.O. box (not included). The rear shall also have a 0.375" diameter hole with grommet for wire access. Two sides shall have knockouts for 500 Series wire mold. The backbox shall measure 11.5" square x 4" deep and have a white powder epoxy finish. It shall feature four holes and 8-32 U-clips at flanged corners to accept a screw-mount grille (order separately). The grille for the 8" speaker shall be Lowell Model SG-8. It shall be formed with 22-gauge steel, have beveled edges and a square punched center. The grille shall be 11.438" square with a mounting projection of 0.125". It shall include a chipboard gasket and 8-32 x 3/4" welded studs with hex nuts to mount the specified 8" speaker. Grille shall also have four 0.218" holes on 9.062" centers to mount specified recessed or surface backbox. Grille shall be finished in white powder epoxy and shall include white screws for backbox installation.

b. The loudspeaker shall be a dual cone 8-inch speaker equivalent to Lowell Model No. 810-T72 which shall be of the permanent magnet type having a seamless molded fiber cone with a hard fiber whizzer cone mechanically coupled to a voice coil for extended high frequency response. Power rating shall be 15 watts RMS. The voice coil shall have a 1-in. dia. and shall operate in a magnetic field derived from a strontium ferrite (ceramic) magnet having a nominal weight of 10 oz. Voice coil impedance shall be 8ohms. The mounted transformer shall be 70/25V dual voltage with selectable taps at .25, .5, 1, 2, and 5W. The assembly shall be capable of producing a uniform audible frequency response over the range of 51Hz-11.6kHz (+6dB), 50Hz- 20kHz (+6.4dB) with dispersion angle of 95 degrees conical @2000Hz (-6dB).

3. Horn Type Speakers

a. The horn shall be equivalent to Lowell Model LH-15TA, which shall be a double reentrant design with a high efficiency 15W compression driver, round bell and universal swivel-style base. Power rating shall be 15 watts continuous. Frequency response shall be 537Hz-4.5kHz (+6dB) with a sensitivity of 112.2dB log average (1W/1M) 124.0dB maximum SPL (calculated based on power rating and measured sensitivity). Dispersion shall be 50 degrees conical (2kHz Octave Band). Impedance shall be 5000, 2500, 1300, 670, 330, 90, 45 ohms. Horn shall include a 25/70/100V transformer with screwdriver selectable taps. Taps for 25V use shall be: .13, .25, .48, .93, 1.9, 6.9, and 13.9W. Taps for 70V use shall be: 1, 2, 3.8, 7.5, and 15W. Taps for 100V use shall be: 2, 4, 7.7 and 15W. Transformer connections shall be protected by a plastic cover with strain relief. The horn assembly shall measure 8.94" dia. x 9.38" deep and shall be weather-resistant metal construction painted in corrosion-resistant beige epoxy.

E. CLOCKS

1. Analog Clocks

- a. The analog clock shall be equivalent to Sapling model SAL-2BS-12R-0 wireless battery operated clock with a black hour hand, a black minute hand, and a red second hand. The clock will be capable of receiving and then re-transmitting a signal from any other Sapling device that transmits data using Sapling's wireless protocol. The clock shall use frequency-hopping technology to receive time data on a frequency range of 915–928 MHz. The clock shall also be able to retransmit time data on the same frequencies. The frequency-hopping technology shall allow the clock to transmit time data without causing interference to other wireless devices that may be transmitting at the same time. The clock shall be designed to be used with the Sapling SMA Series Master Clock (with the transmitter option installed) or the Sapling Repeater. Time data shall be transmitted and received by the clock via Sapling's wireless communication protocol. The clock shall also be designed to receive and retransmit time data to Sapling's SBL Series clocks and other SAL Series clocks. Upon receipt of the wireless signal, the clock will immediately self-correct. The clock's transmitter shall be able to successfully transmit data over a line-of-sight, unobstructed distance of up to 1320 feet.
- b. The clock shall include an executable method for automatic hand calibration, as well as a diagnostic function that allows the user to view the quality of the signal, the last time the clock received a correction signal, the performance and results of a gearbox test, and a comprehensive analysis of the entire clock movement. These diagnostic functions shall be enabled by pressing a button on the clock movement.
- c. The clock shall require fewer than five (5) minutes to perform a correction of the hand positions.
- d. The clock shall be capable of receiving a time and correction signal every two (2) hours in standard mode and every four (4) hours in economy mode.
- e. The battery life of the clock shall be five (5) hours in standard mode and eight (8) hours in economy mode.
- f. The clock shall have a smooth surface ABS case which can be attached either directly to the wall, or to a standard-sized gang box.
- g. The crystal is to be made of shatterproof, side molded polycarbonate.
- h. The clock shall be FCC compliant, in accordance with part 15 Section 15.247.
- i. Analog clocks shall be set to operate in the economy mode.
- j. Batteries for wireless battery operated clocks shall be included as part of this bid.

F. MEDIA PLAYER

1. The media player shall be equivalent to Denon DN-300Z media player with Bluetooth receiver and AM/FM tuner. The media player shall have the features listed below:
 - a. Super-fast loading, slot-in CD player
 - b. Supports removable USB thumb and HDDs, SD/SDHC cards
 - c. Wireless audio playback from tablets and smartphones via Bluetooth
 - d. Selectable Power-On-Play mode automatically plays USB, SD or CD tracks when powered up — simply turn it on
 - e. Up to 100 foot (30m) wireless Bluetooth range
 - f. Plays CD-DA, MP3, WAV, and AAC files
 - g. 3.5mm (1/8-inch) input for audio playback of any audio device with a 3.5mm output
 - h. AM/FM Tuner w/ dedicated audio out for multi-room use
 - i. RCA and balanced XLR audio outputs
 - j. 10-key direct track access

- k. Random, repeat, and single play playback modes
 - l. Remembers up to 8 Bluetooth devices for simple switching of wireless audio sources
 - m. Folder only and All play modes
 - n. Lockable front-panel keeps program material from being interrupted
 - o. IR controllable with included, compact remote
 - p. 1RU chassis with removable rack ears
 - q. Detachable IEC-weighted AC inlet
 - r. 100-220v switching power supply
2. Provide AM & FM antennas as required for reception of AM & FM radio signals.

G. WIRE AND CABLE

1. Plenum rated cable as specified by product manufacture.

H. CALL-IN SWITCHES

1. Call-n switches shall be equivalent to Carehawk model CS45. The CS45 has a momentary call-in button to provide a method to initiate a normal intercom call (single press) or an emergency intercom call (double press) that is received by the AP1 Administrative Phone.
 - a. The CS45 call-in switch shall also provide a latching privacy feature to allow the user to prevent unauthorized eavesdropping.
 - b. The CS45 interfaces with a SS16/SS32 Security Switching Card audio port.
 - c. The CS45 provides pig tail connectivity for a cable from the SS16/ SS32 Security Switching Card port and classroom loudspeaker.
 - d. Construction shall consist of rocker-type push button mounted to brushed stainless steel plate for durability.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. The Intercom system shall be designed, installed, and commissioned in a turnkey fully implemented and operational manner. The Contractor shall be responsible for all electrical installation required for a fully functional intercom system. All wiring shall be in accordance to all local and national codes. All line voltage wiring and all wiring in equipment rooms shall be installed in conduit and in accordance with NEC and local codes.
 1. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of intercom systems.
- B. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations.
 1. All intercom system wiring shall be in a completely separate conduit system, except where cable is allowed below. All circuitry shall be concealed in walls and above ceilings.
 2. Wiring color code shall be maintained throughout the installation. All new wiring shall have each conductor tagged and identified. Wiring for like functions shall be color-coded consistently throughout the systems.
 3. Verify all circuiting requirements with equipment manufacturer before installation.

- C. All circuitry shall be properly supported and run in a neat and workmanlike manner. All circuitry shall run parallel to or at right angles to the building structure. All wiring within enclosures shall be neatly bundled and anchored to prevent obstruction to devices and terminals. All electronic wiring shall be type and size as recommended by system manufacturer.
1. Where installed above accessible ceilings, intercom cabling may be installed in a neat manner, tightly bundled and independently secured to building structure by approved means. Do not lay cable on ceiling and do not support from other conduit systems, ductwork or piping. Utilize plenum rated cable in return air plenums.
 2. Where devices are to be installed on, or cabling is to pass through frame walls or hollow masonry walls the cabling shall be fished in the wall cavity to an appropriate flush outlet box firmly mounted in the wall.
 3. Where devices are to be installed on or cabling is to be routed over solid masonry walls the cabling shall be installed in approved surface mounted raceways equal to Wiremold or equivalent. Where installed in rooms with accessible ceilings the surface raceways shall be routed vertically from the ceiling to the device in a neat and workman like manner. Verify all routing of surface raceways with the Architect.
 4. Where approved surface mounted raceways are used, the device mounting boxes shall be finished surface boxes of suitable size for the device installation.
- D. Labor to troubleshoot, repair, reprogram, or replace system components shall be furnished by the intercom contractor at no charge to the Owner during the warranty period.
- E. All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks.
- F. The intercom contractor shall maintain electronic copies of all data file and application software for reload use in the event of a system crash or memory failure. One copy shall be delivered to the Owner during training session, and one copy shall be archived by the intercom manufacturer.
- G. The contractor shall clean all dirt and debris from the inside and the outside of all system equipment after completion of the installation.

3.2 CLEANING:

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

3.3 FIELD QUALITY CONTROL AND TESTING:

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
1. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of intercom systems.
- B. Coordinate the testing during occupied hours with the Owner to minimize disruption of the daily schedule.

- C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
- D. Final Test Notice: Provide a 10-day minimum notice in writing to the Architect when the system is ready for final acceptance testing.
- E. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- F. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.

3.4 INSTRUCTION:

- A. All training shall be by the Intercom manufacturer's trained representative and shall utilize Operation and Maintenance manuals and as-built documentation. Manual documentation shall include:
 - 1. Operation sequences with specific to specific hardware components - Wiring diagrams
 - 2. System software documentation.
 - 3. Operation instructions.
 - 4. Maintenance instructions.
 - 5. Troubleshooting instructions.
- B. Following the completion of work, the Owner's representative shall be given a minimum of two (2) two hour sessions of instructions on operation and maintenance of the completed system. Training topics shall include:
 - 1. Sequence of Operation review.
 - a. Operating station equipment.
 - b. Administrative devices.
 - c. User programming functions.
 - d. Program distribution equipment.
- C. Deliver to the Owner at the time of the first training session three complete Operation and Maintenance Manuals.

3.5 WARRANTY:

- A. The contractor shall warrant the completed intercom system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one year from the date of the completed and certified test or from the date of first beneficial use.
- B. A representative of the manufacturer shall provide at least two inspections of the complete system during the one year warranty period.

- C. Labor to troubleshoot, repair, reprogram, or replace system components shall be furnished by the intercom contractor at no charge to the Owner during the warranty period.
- D. All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks. All firmware or resident software updates and new releases shall be supplied and installed free of charge for two years after the project warranty is expired.
- E. The equipment manufacturer shall make available to the Owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines, to begin after the warranty period expires.

END OF SECTION 27 88 00