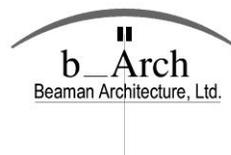


Okanogan County Public Works Shop Buildings

SPECIFICATIONS

July 2021

Architects
Project No. 21102



OKANOGAN COUNTY PUBLIC WORKS
SHOP BUILDINGS

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Access to site.
- 4. Coordination with occupants.
- 5. Work restrictions.
- 6. Specification and Drawing conventions.

B. Related Requirements:

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

1.3 PROJECT INFORMATION

A. Project Identification: Okanogan County Public Works Shop Buildings.

- 1. Project Locations: Existing Okanogan County-Owned Public Works Sites at 10 Intercity Airport Road, Twisp, Washington and at 28 Tonasket Shop Road, Tonasket, Washington.

B. Owner: Okanogan County.

- 1. Owner's Representative: Josh Thomson, 1234-A 2nd Avenue South, Okanogan, Washington 98840.

C. Architect: Michael Beaman, Beaman Architecture, Ltd. 1634 SE 54th Avenue, Portland, Oregon 97215.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

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

- 1. 2 New Maintenance Shop Buildings, 1 in Twisp, Washington and 1 in Tonasket, Washington, of similar design. Both Buildings are Pre-Manufactured Metal Buildings on a new concrete slab foundation.

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- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.5 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 10 feet beyond surface walkways, patios, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, storm-water detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
 - 2. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles always. 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 Buildings: Maintain portions of existing buildings affected by construction operations in a weather-tight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing, adjacent buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.

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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 4:00 p.m., Monday through Friday, unless otherwise indicated.
 1. Weekend Hours: As accepted by Owner.
 2. Early Morning Hours: As accepted by Owner.
 3. Hours for Utility Shutdowns: As accepted by Owner.
 4. Hours for Core Drilling: As accepted by Owner.

- 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.
 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. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to always use identification tags.

- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 1. Maintain list of approved screened personnel with Owner's representative.

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. 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:

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1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing more detailed information found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified 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

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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 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

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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. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. 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: Architect will consider requests for substitution if received within 10 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Requested substitution provides sustainable design characteristics that specified product provided.
 - e. Substitution request is fully documented and properly submitted.
 - f. Requested substitution will not adversely affect Contractor's construction schedule.
 - g. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - h. Requested substitution is compatible with other portions of the Work.
 - i. Requested substitution has been coordinated with other portions of the Work.
 - j. Requested substitution provides specified warranty.

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- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Form included in Project Manual.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.

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- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 7. Proposal Request Form: Use facsimile of Form included in Project Manual.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on facsimile of Form included in Project Manual.

1.6 WORK CHANGE DIRECTIVE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600



Contract Administration

G709 Work Changes Proposal Request

(Instructions on the reverse side)

Distribution List:

Owner _____
 Architect _____
 Consultant _____
 Contractor _____
 Field _____
 Other _____

PROJECT *(Name and address):*

PROPOSAL REQUEST NUMBER:

OWNER *(Name and address):*

DATE OF ISSUANCE:

CONTRACT FOR:

FROM ARCHITECT *(Name and address):*

CONTRACT DATE:

ARCHITECT'S PROJECT NUMBER:

TO CONTRACTOR *(Name and address):*

Please submit an itemized proposal for changes in the Contract Sum and Contract Time for proposed modifications to the Contract Documents described herein. Within _____ () days, the Contractor must submit this proposal or notify the Architect, in writing, of the date on which proposal submission is anticipated.

THIS IS NOT A CHANGE ORDER, A CONSTRUCTION CHANGE DIRECTIVE OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.

DESCRIPTION *(Insert a written description of the Work):*

ATTACHMENTS *(List attached documents that support description):*

REQUESTED BY THE ARCHITECT:

BY _____
(Signature)

(Printed name and title)

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures changes will not be obscured.



Contract Administration G701 Change Order

(Instructions on the reverse side)

Distribution List:
Owner _____
Architect _____
Contractor _____
Field _____
Other _____

PROJECT (Name and address):

CHANGE ORDER NUMBER:

DATE:

TO CONTRACTOR (Name and address):

ARCHITECT'S PROJECT NUMBER:

CONTRACT DATE:

CONTRACT FOR:

THE CONTRACT IS CHANGED AS FOLLOWS:

(Include, where applicable, any undisputed amount attributable to previously executed Construction Change Directives)

The original (Contract Sum) (Guaranteed Maximum Price) was	\$ _____
The net change by previously authorized Change Orders	\$ _____
The (Contract Sum) (Guaranteed Maximum Price) prior to this Change Order was	\$ _____
The (Contract Sum) (Guaranteed Maximum Price) will be (increased) (decreased) (unchanged) by this Change Order in the amount of	\$ _____
The new (Contract Sum) (Guaranteed Maximum Price) including this Change Order will be	\$ _____
The Contract Time will be (increased) (decreased) (unchanged) by _____ () days.	
The date of Substantial Completion as of the date of this Change Order therefore is _____	

NOTE: This Change Order does not include changes in the Contract Sum, Contract Time or Guaranteed Maximum Price which have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

ARCHITECT (Firm name)

CONTRACTOR (Firm name)

OWNER (Firm name)

ADDRESS

ADDRESS

ADDRESS

BY (Signature)

BY (Signature)

BY (Signature)

(Typed name)

(Typed name)

(Typed name)

DATE

DATE

DATE

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures changes will not be obscured.



Contract Administration

G714 Construction Change Directive

Distribution List:
 Owner _____
 Architect _____
 Consultant _____
 Contractor _____
 Field _____
 Other _____

PROJECT *(Name and address):*

DIRECTIVE NUMBER:

TO CONTRACTOR *(Name and address):*

DATE:

CONTRACT FOR:

CONTRACT DATE:

ARCHITECT'S PROJECT NUMBER:

You are hereby directed to make the following change(s) in this Contract:
(Describe briefly any proposed changes or list any attached information in the alternative)

PROPOSED ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum or Guaranteed Maximum Price is:

- Lump Sum (increase) (decrease) of \$ _____
- Unit Price of \$ _____ per _____
- As provided in Subparagraph 7.3.3 of AIA Document A201-1997
- As follows:

2. The Contract Time is proposed to (be adjusted) (remain unchanged). The proposed adjustment, if any, is (an increase of _____ days) (a decrease of _____ days).

When signed by the Owner and Architect and received by the Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and the Contractor shall proceed with the change(s) described above.

Contractor signature indicates agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this CCD.

ARCHITECT *(Firm name)*

OWNER *(Firm name)*

CONTRACTOR *(Firm name)*

ADDRESS

ADDRESS

ADDRESS

BY *(Signature)*

BY *(Signature)*

BY *(Signature)*

(Typed name)

(Typed name)

(Typed name)

DATE

DATE

DATE

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures changes will not be obscured.

OKANOGAN COUNTY PUBLIC WORKS
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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Sub-schedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work provide sub-schedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

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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. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Work Change Directives result in a change in the Contract Sum.

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1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as forms for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Work 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 one signed and notarized electronic copy of each Application for Payment to Architect. Electronic 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.

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- 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 pre-ceded 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. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Submittal schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
 14. 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 liquidated damages settlement statement.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

TO OWNER: PROJECT: APPLICATION NO.: Distribution to:
 PERIOD TO: OWNER
 PROJECT NOS.: ARCHITECT
 FROM CONTRACTOR: VIA ARCHITECT: CONTRACT DATE: CONTRACTOR

CONTRACT FOR:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. Continuation Sheet, AIA Document G703, is attached.

- 1. ORIGINAL CONTRACT SUM\$ _____
- 2. Net change by Change Orders\$ _____
- 3. CONTRACT SUM TO DATE (Line 1 ± 2)\$ _____
- 4. TOTAL COMPLETED & STORED TO DATE\$ _____
 (Column G on G703)
- 5. RETAINAGE:
 a. _____% of Completed Work\$ _____
 (Columns D + E on G703)
 b. _____% of Stored Material\$ _____
 (Column F on G703)
 Total Retainage (Line 5a + 5b or
 Total in Column I of G703)\$ _____
- 6. TOTAL EARNED LESS RETAINAGE\$ _____
 (Line 4 less Line 5 Total)
- 7. LESS PREVIOUS CERTIFICATES FOR PAYMENT
 (Line 6 from prior Certificate)\$ _____
- 8. CURRENT PAYMENT DUE\$
- 9. BALANCE TO FINISH, INCLUDING RETAINAGE
 (Line 3 less Line 6)\$ _____

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner		
Total approved this Month		
TOTALS		
NET CHANGES by Change Order		

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due

CONTRACTOR:
 By: _____ Date: _____

State of:
 County of:
 Subscribed and sworn to before
 me this _____ day of _____

Notary Public:
 My Commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED\$ _____

(Attach explanation if amount certified differs from the amount applied for. Initial all figures on this Application and on the Continuation Sheet that are changed to conform to the amount certified.)

ARCHITECT:
 By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CONTINUATION SHEET

AIA DOCUMENT G703 (Instructions on reverse side)

PAGE OF PAGES

AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification, is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO.:

APPLICATION DATE:

PERIOD TO:

ARCHITECT'S PROJECT NO.:

A ITEM NO.	B DESCRIPTION OF WORK	C SCHEDULED VALUE	D WORK COMPLETED		F MATERIALS PRESENTLY STORED (NOT IN D OR E)	G		H BALANCE TO FINISH (C - G)	I RETAINAGE (IF VARIABLE) RATE
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD		TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)		



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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone

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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. 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. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

C. 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:

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- 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. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - 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.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. 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 Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: DWG, Version 2016, operating in Microsoft Windows operating system.
 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in DWG, Version 2016, operating in Microsoft Windows operating system.
- 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.
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.

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- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

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1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.
 - d. Lines of communications.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises.
 - m. Work restrictions.

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- n. Working hours.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Construction waste management and recycling.
 - t. Parking availability.
 - u. Office, work, and storage areas.
 - v. Equipment deliveries and priorities.
 - w. First aid.
 - x. Security.
 - y. Progress cleaning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility requirements.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written instructions.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Installation procedures.
 - u. Coordination with other work.
 - v. Required performance results.
 - w. Protection of adjacent work.
 - x. 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.

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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. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Status of documentation.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of proposal requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) 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.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

- B. Related Requirements:

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

1.3 DEFINITIONS

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

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

- B. 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.

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- 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. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup 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 the 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.

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- 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.

1.5 QUALITY ASSURANCE

- A. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. 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 work stages, area separations and interim milestones.
 - 4. Review submittal requirements and procedures.
 - 5. Review time required for review of submittals and re-submittals.
 - 6. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 7. Review time required for Project closeout and Owner startup procedures.
 - 8. Review and finalize list of construction activities to be included in schedule.
 - 9. 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 and Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat 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.

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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. Metal Building Systems.
 3. Submittal Review Time: Include review and re-submittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Seasonal variations.
 2. 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.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.

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- 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.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use Microsoft Project, for Windows 10 operating system.

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven 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. Startup 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 30 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 startup network diagram, prepare a skeleton network to identify probable critical paths.

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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.
 - 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. 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. 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.

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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.

2.4 REPORTS

- A. Material Location Reports: At weekly 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.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, 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.

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- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

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1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 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. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will [not] be provided by Architect for Contractor's use in preparing submittals.
 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD V2000, Microsoft Windows 10.
 - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
 - d. The following digital data files will be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

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4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Re-submittal Review: Allow 15 days for review of each re-submittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

- D. Paper Submittals: Not acceptable, unless specifically allowed by Architect.

- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Re-submittals 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 of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.

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- n. Indication of full or partial submittal.
 - o. Transmittal number, numbered consecutively.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- I. 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.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- 1. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be

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signed by an officer or other individual authorized to sign documents on behalf of that entity.

- a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. 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.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Submit Shop Drawings in the following format:
 - a. PDF electronic file.

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- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample set; 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.

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- 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. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. 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.
- M. 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.
- N. 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.
- O. 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.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

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- R. 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.
- S. 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.
- T. 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.
- U. 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.
- V. 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.
- W. 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.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

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

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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.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for re-submittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

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

1.4 CONFLICTING REQUIREMENTS

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

1.5 ACTION SUBMITTALS

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

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1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice 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:

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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.
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

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.

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- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement that equipment complies with requirements.
 - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 4. Statement, whether conditions, products, and installation will affect warranty.
 - 5. Other required items indicated in individual Specification Sections.

- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly or product that are similar in material, design, and extent to those indicated for this Project.

- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

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2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.

 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed unless otherwise indicated.

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- L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 - 3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

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- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not, release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Engage a qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:
- B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and as follows:

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1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

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

END OF SECTION 014000

OKANOGAN COUNTY PUBLIC WORKS
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SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "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.

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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 Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
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ICC	International Code Council www.iccsafe.org	(888) 422-7233
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ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
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C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
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CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
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DOC	Department of Commerce www.commerce.gov	(202) 482-2000
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DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-6257
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DOE	Department of Energy www.energy.gov	(202) 586-9220
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EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
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FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
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FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science http://www.hhs.gov/ophs/	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772
USPS	Postal Service www.usps.com	(202) 268-2000

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA)	(800) 872-2253
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	Architectural Barriers Act (ABA)	(202) 272-0080
	Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	
CFR	Code of Federal Regulations	(866) 512-1800
	Available from Government Printing Office	(202) 512-1800
	www.gpoaccess.gov/cfr/index.html	
DOD	Department of Defense Military Specifications and Standards	(215) 697-2664
	Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification	(215) 697-2664
	Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil/	
	Available from Defense Standardization Program www.dsp.dla.mil	
	Available from General Services Administration	(202) 619-8925
	www.gsa.gov	
	Available from National Institute of Building Sciences	(202) 289-7800
	www.wbdg.org/ccb	
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards	(215) 697-2664
	Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	
UFAS	Uniform Federal Accessibility Standards	(800) 872-2253
	Available from Access Board	(202) 272-0080
	www.access-board.gov	

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E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(800) 952-5210 (916) 574-2041
CCR	California Code of Regulations www.calregs.com	(916) 323-6815
CDHS	California Department of Health Services www.dhcs.ca.gov	(916) 445-4171
CDPH	California Department of Public Health, Indoor Air Quality Section www.cal-iaq.org	
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(415) 703-2782
TFS	Texas Forest Service Forest Resource Development http://txforests-service.tamu.edu	(979) 458-6606

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water 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 Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. 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.

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1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- 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. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste handling procedures.
 5. Other dust-control measures.

1.5 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. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

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2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer, than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

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3.2 TEMPORARY UTILITY INSTALLATION

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

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

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1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- G. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- H. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: 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 2003 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.

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- D. Storm-water Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and sub-grade construction to prevent flooding by runoff of storm-water from heavy rains.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: Before construction operations begin, furnish, and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- J. 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 weather-tight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

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

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- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.

- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use permanent HVAC system to control humidity.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

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- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

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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 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 013300 "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 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.
 3. Store products that are subject to damage by the elements, under cover in a weather-tight 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.

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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 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: 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.

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- B. 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. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

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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 016000

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

- B. Related Requirements:

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

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

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1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Products: List products to be used for patching and firms or entities that will perform patching work.
3. Dates: Indicate when cutting and patching will be performed.
4. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor.
- F. Final Property Survey: Submit 3 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 2. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended or that results, in increased maintenance or decreased operational life or safety.
 3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

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PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site-work, 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.

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3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

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

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3.4 FIELD ENGINEERING

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

- B. 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.

- C. Certified Survey: On completion of foundations, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site-work.

- D. 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 in occupied spaces and 90 inches in unoccupied spaces.

- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

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- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

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- 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 011000 "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 minimize 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: 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 and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate, and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition and ensures thermal and moisture integrity of building enclosure.

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- 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 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Pre-installation Conferences: Include Owner's construction personnel at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

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

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- 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 015000 "Temporary Facilities and Controls."
- 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.

3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 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.

END OF SECTION 017300

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

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1.6 SUBSTANTIAL COMPLETION PROCEDURES

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

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

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 - 6. Advise Owner of changeover in heat and other utilities.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements, including touchup painting.
 - 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and

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tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Re-inspection: Request re-inspection 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.
1. Organize list of spaces in sequential order, starting with exterior areas first.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:

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- a. PDF electronic file. Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. 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:

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- a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- j. 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.
- k. Remove labels that are not permanent.
- l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. 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.
- p. Clean light fixtures to function with full efficiency.
- q. Leave Project clean and ready for occupancy.

- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities, used during construction, to specified condition.

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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 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 LED arrays, LED arrays noticeably dimmed by hours of use, and any defective lighting to comply with requirements for new lighting.

END OF SECTION 017700

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 CLOSEOUT SUBMITTALS

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

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- a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Initial Manual Submittal: Submit an 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.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments.
- D. Final Manual Submittal: Submit each manual to Owner in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of 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 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 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:

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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 Architect.
 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of

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contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 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.

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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.

2.4 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.

2.5 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,

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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.

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PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. 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.
- D. 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.
- E. 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 017839 "Project Record Documents."
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one of file prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit record digital data files and three sets of record digital data file plots.
 - 2) Plot each drawing file whether, or not, changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

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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.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

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

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- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 4. Refer instances of uncertainty to Architect for resolution.
 5. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
 - b. 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 sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 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.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

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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.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file of marked-up miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING 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

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clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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2. 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.
3. 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. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- C. Pre-Instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 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:

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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:

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

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

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- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. 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 .mp4 format file type, 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.

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- E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Pre-produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Slabs-on-grade.
- B. Related Sections:
 - 1. Section 312000 "Earth Moving" for excavating and backfilling under slabs-on-grade.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with fly ash; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site, if any.
- C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.

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2. Admixtures.
3. Steel reinforcement and accessories.
4. Adhesives.
5. Vapor retarders.

C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

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

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1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.2 STEEL REINFORCEMENT

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

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type I. Supplier may supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
- B. Normal-Weight Aggregates: ASTM C 33, Class 1S coarse aggregate or better, graded. Provide aggregates from a single source.
 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

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

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2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
 - b. Fortifiber Building Systems Group; Moistop Ultra 15.
 - c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - d. Insulation Solutions, Inc.; Viper VaporCheck 16.
 - e. Meadows, W. R., Inc.; Perminator 15 mil.
 - f. Raven Industries Inc.; Vapor Block 15.
 - g. Reef Industries, Inc.; Griffolyn Type-105, 10 mil Green.
 - h. Stego Industries, LLC; Stego Wrap 15 mil Class A.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

2.8 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

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2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as indicated in the Structural General Notes.
- B. Slabs-on-Grade: Proportion normal-weight concrete mixture as indicated in the Structural General Notes.

2.10 FABRICATING REINFORCEMENT

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

2.11 CONCRETE MIXING

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

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class C, 1/2 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to

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prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- H. Do not chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

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

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

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

1. Place and compact a 1/2-inch- thick layer of sand over granular course.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Locate horizontal joints at the top of footings or floor slabs.

3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

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- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed-water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen sub-grade or on sub-grade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and sub-grade just before placing concrete. Keep sub-grade uniformly moist without standing water, soft spots, or dry areas.

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3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated and to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, or thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - 3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.9 MISCELLANEOUS CONCRETE ITEMS

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

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs and other surfaces.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.

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- c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
- 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. After concrete has cured at least 14 days, correct high areas by grinding.
 - 2. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 3. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact and finish to, blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 5. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- E. Repair materials and installation not specified above may be used, subject to Architect's approval.

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3.12 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections: As indicated in the Structural General Notes.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - 7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 - 8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 - 9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 - 10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting

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agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

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

END OF SECTION 033000

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SECTION 055000 - METAL FABRICATIONS

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. Steel framing and supports for mechanical and electrical equipment.
- 2. Shelf angles.
- 3. Miscellaneous steel trim.
- 4. Loose bearing and leveling plates for applications where they are not specified in other Sections.

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

- 1. Anchor bolts and steel pipe sleeves, indicated to be cast into concrete.
- 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:

- 1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves and other items cast into concrete.

1.3 PERFORMANCE REQUIREMENTS

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

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

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

- 1. Paint products.
- 2. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

- 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

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

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2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
 - 2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 coating; 0.108-inch nominal thickness.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip-galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Machine Screws: ASME B18.6.3.
- F. Lag Screws: ASME B18.2.1.
- G. Wood Screws: Flat head, ASME B18.6.1.
- H. Plain Washers: Round, ASME B18.22.1.
- I. Lock Washers: Helical, spring type, ASME B18.21.1.
- J. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- K. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- L. Post-Installed Anchors: Chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

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2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

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

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 099100 "Painting."
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

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- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated, coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

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

2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.

2.8 MISCELLANEOUS STEEL TRIM

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

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2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.

2.10 STEEL WELD PLATES AND ANGLES

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

2.11 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL FINISHES

- A. Galvanizing: Hot-Dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime steel items not indicated to be galvanized unless they are to be embedded in concrete or unless otherwise indicated.
 - 1. Shop prime with zinc-rich primer.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

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PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use non-shrink nonmetallic grout in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

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3.4 ADJUSTING AND CLEANING

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

END OF SECTION 055000

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SECTION 055100 - METAL STAIRS

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. Industrial-type stairs with steel floor plate treads.
 - 2. Steel tube railings attached to metal stairs.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Washington, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform Load: 100 lbf/sq. ft.
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less.
- C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

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1. Component Importance Factor is 1.5.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:
 1. Metal floor plate treads.
 2. Paint products.
 3. Grout.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For the following products, in manufacturer's standard sizes:
 1. Metal floor plate treads.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, licensed in the State of Washington, responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer licensed in the State of Washington.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs and railings.
 1. Test railings according to ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
 1. Industrial-Type Stairs: Industrial class.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

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1.7 COORDINATION

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

PART 2 - PRODUCTS

2.1 METALS, GENERAL

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

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. IKG Industries, a division of Harsco Corporation; Mebac.
 - b. SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.
- E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 where built, into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

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- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Screws: ASME B18.2.1.
- F. Plain Washers: Round, ASME B18.22.1.
- G. Lock Washers: Helical, spring type, ASME B18.21.1.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Non-Shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior applications.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

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- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.6 STEEL-FRAMED STAIRS

- A. Stair Framing:
 - 1. Fabricate stringers of steel tubes.
 - a. Provide closures for exposed ends of tube stringers.
 - 2. Construct platforms of steel tube headers and miscellaneous framing members as needed to comply with performance requirements.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
- B. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from abrasive-surface floor plate of thickness needed to comply with performance requirements, but not less than 3/16 inch.
 - 1. Form treads with integral nosing and back edge stiffener. Form risers from steel sheet not less than 0.097 inch thick, welded to tread nosing and stiffeners and to platforms.
 - 2. Weld steel supporting brackets to stringers and weld treads to brackets.
 - 3. Fabricate platforms with integral nosing matching treads and weld to platform framing.

2.7 STAIR RAILINGS

- A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
 - 1. Rails and Posts: 1-5/8-inch- diameter top and bottom rails and 1-1/2-inch- square posts.
 - 2. Picket Infill: 1/2-inch- square pickets spaced less than 4 inches clear.
- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.

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- C. Form changes in direction of railings as follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
 - 1. Connect posts to stair framing by direct welding unless otherwise indicated.
 - 2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in concrete construction.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
 - 1. Interior Stairs: SSPC-SP 3, "Power Tool Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

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PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- E. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonmetallic, non-shrink grout unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends, to building construction as follows:
 - 1. Anchor posts to steel by welding directly to steel supporting members.
 - 2. Anchor handrail ends to concrete with round steel flanges welded to rail ends and anchored with post-installed anchors and bolts.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

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END OF SECTION 055100

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SECTION 061600 - SHEATHING

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. Wall sheathing.
 - 2. Subflooring.
 - 3. Underlayment.

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

- A. Plywood Wall Sheathing: Exposure 1 sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 3/4 inch.

2.3 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Subflooring: Exposure 1, Structural I single-floor panels or sheathing.
 - 1. Span Rating: Not less than 24 o.c.

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2. Nominal Thickness: Not less than 23/32 inch.

- B. Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch over board or uneven subfloors.
- C. Particleboard Underlayment: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 - 1. For wall sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Use common screws unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

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3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Subflooring:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - 2. Wall Sheathing:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - 3. Underlayment:
 - a. Screw to subflooring.
 - b. Space panels 1/32 inch apart at edges and ends.
 - c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

3.3 PARTICLEBOARD UNDERLAYMENT INSTALLATION

- A. Comply with CPA's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.
 - 1. Fastening Method: Screw underlayment to subflooring.

END OF SECTION 061600

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SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate and cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- C. Samples for Initial Selection:
 - 1. Thermoset decorative panels.
- D. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
 - 2. Exposed cabinet hardware and accessories, one unit for each type and finish.
 - 3. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish, with edge banding on one edge.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Product Certificates: For each type of product.

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1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed and indicate, measurements on Shop Drawings.

1.8 COORDINATION

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

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. Type of Construction: Frameless.

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- D. Cabinet, Door, and Drawer Front Interface Style: Reveal overlay.
- E. Reveal Dimension: As indicated.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Corporation.
 - b. Panolam Industries International, Inc.
 - c. Wilsonart International; Div. of Premark International, Inc.
- G. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Edges: Grade HGS.
- H. Materials for Semi-exposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
 - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by laminate manufacturer's designations, in Plastic-Laminate-Faced Architectural Cabinets Color Schedule at the end of Part 3.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Plastic Laminate Faced Panel Products (Hardwood Plywood): HPVA HP-1 made with adhesive containing no urea formaldehyde.
 - 2. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

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2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:
 - 1. Semi-concealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- F. Drawer Slides: BHMA A156.9.
 - 1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-over-travel-extension type; zinc-plated-steel ball-bearing slides.
 - 2. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
 - 3. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
- G. Door Locks: Best 5L Series; all doors.
- H. Drawer Locks: Best 5L Series; all drawers.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

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

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2.5 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Owner seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets, level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk, and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.

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

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi-exposed surfaces.

3.4 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS COLOR SCHEDULE

- A. Plastic Laminate PLAM-#: Where this designation is indicated, provide plastic laminate complying with the following type/color/finish numbers:
 - 1. PLAM-1: Nevamar, #RK6003T, "Verdicts In" Textured.

END OF SECTION 064116

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SECTION 072100 - THERMAL INSULATION

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. Foam-plastic board insulation for under-slab.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

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PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Pactiv Building Products.
 - 2. Type IV, 25 psi.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

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

3.3 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units loosely laid according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

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- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 PROTECTION

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

END OF SECTION 072100

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SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Preformed flashing sleeves.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between, plant- and field-assembled work.
- C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.6 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing and flashings and interfacing and adjoining construction to provide a leak-proof, weather-tight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment penetrations to be flashed.

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PART 2 - PRODUCTS

2.1 PREFORMED FLASHING SLEEVES

- A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted metal collar.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Solution Roof and Metal Products.
 - b. Thaler Metal USA Inc.
 2. Metal: Aluminum sheet, 0.063 inch thick.
 3. Diameter: As required, verify.
 4. Finish: Manufacturer's standard.
- B. Vent Stack Flashing: Metal flashing sleeve, un-insulated, with integral deck flange.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Solution Roof and Metal Products.
 - b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
 - c. Thaler Metal USA Inc.
 2. Metal: Aluminum sheet, 0.063 inch thick.
 3. Height: 13 inches.
 4. Diameter: As required, verify.
 5. Finish: Manufacturer's standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.

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1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roofing system according to flashing-sleeve manufacturer's written instructions.

C. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

B. Clean off excess sealants.

C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 080000 - DOOR SCHEDULE

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NO.	Room Name	DOOR					FRAME			U.L. RT'G.	GLASS TYPE	KEY NOTES
		Type	Mat'l	Fin.	DIMENSIONS		Type	Mat'l	Fin.			
					Width	Height						
100A	Shop Area	C	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	G2	1, 3
100B	Shop Area	C	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	G2	1, 3
100C	Shop Area	C	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	G2	1, 2, 3
100D	Shop Area	F	STL	FAC	16'-0"	15'-0"	---	STL	FAC	~	G3	1, 2, 3
100E	Shop Area	F	STL	FAC	16'-0"	15'-0"	---	STL	FAC	~	G3	1, 2, 3
100F	Shop Area	F	STL	FAC	16'-0"	15'-0"	---	STL	FAC	~	G3	1, 2, 3
100G	Shop Area	F	STL	FAC	16'-0"	15'-0"	---	STL	FAC	~	G3	1, 2, 3
100H	Shop Area	F	STL	FAC	16'-0"	15'-0"	---	STL	FAC	~	G3	1, 2, 3
100I	Shop Area	F	STL	FAC	16'-0"	15'-0"	---	STL	FAC	~	G3	1, 2, 3
101A	Office	B	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	G1	1, 3
101B	Office	B	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	G1	1, 3
102A	Vestibule	C	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	G2	1, 3
102B	Vestibule	C	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	G1	1
103A	Toilet	A	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	~	1
104A	Toilet	A	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	~	1
105A	Staff Breakroom	D	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	G1	1
106A	Compressor	A	HM	FAC	3'-0"	7'-0"	1	HM	FAC	~	~	1

ABBREVIATIONS

HM - HOLLOW METAL

STL - STEEL

FAC - FINISHED AT FACTORY

KEY NOTES

1. See Drawing Sheet A2-1 for door and frame types.
2. Overhead Coiling Doors.
3. Wet location / galvanized frame and hardware.

GENERAL NOTES

- A. Contractor to coordinate door and frame cut-outs with hardware specified. Verify all opening sizes prior to frame installation.
- B. See Glazing Key on Sheet A2-1 for Glass Types noted.
- D. See Specification Section 087100 for Door Hardware Schedule.
- E. See Spec. Sect. 083323 for Glazing Type at Overhead Coiling Doors.
- F. Door Frame Details are noted as looking from inside the room.
- G. See Door and Frame types on Sht. A2-1 for all detail references.

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SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Insulated service doors.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Washington, using performance requirements and design criteria indicated.
- B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
 - 1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
 - a. Basic Wind Speed: 85 mph.
 - b. Importance Factor: .87.
 - c. Exposure Category: C.
 - 2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- C. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. wind load, acting inward and outward.
- D. Windborne-Debris-Impact-Resistance Performance: Provide glazed and impact-protective overhead coiling doors that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and ASTM E 1996.
 - 1. Large Missile Test: For overhead coiling doors located within 30 feet of grade.
 - 2. Small Missile Test: For overhead coiling doors located more than 30 feet above grade.
- E. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

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2. Seismic Component Importance Factor: 1.0.

F. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Curtain Slats: 12 inches long, including vision window secured to slat.
2. Bottom Bar: 6 inches long.
3. Guides: 6 inches long.
4. Brackets: 6 inches square.
5. Hood: 6 inches square.

E. Delegated-Design Submittal: For overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the State of Washington responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Summary of forces and loads on walls and jambs.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Seismic Qualification Certificates: For overhead coiling doors, accessories, and components, from manufacturer.

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1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling door manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch and as required to meet requirements.
 - 2. Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet; set in glazing channel secured to curtain slats.
 - 3. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
 - 4. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
 - 5. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.
- B. End-Locks and Wind-Locks for Service Doors: Malleable-iron casing galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from manufacturer's standard hot-dip galvanized steel extrusions to match curtain slats and finish.
- D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength

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to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding wind-locks.

2.2 HOOD

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.
 - 2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.3 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Provide cylinders specified in Section 087100 "Door Hardware".
 - 2. Keys: Provide three for each cylinder.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 CURTAIN ACCESSORIES

- A. Weather-Seals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
 - 1. At door head, use 1/8-inch- thick, replaceable, continuous sheet secured to inside of hood.
 - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.
- B. Push/Pull Handles: Equip each emergency-operated door with lifting handles on each side of door, finished to match door.
 - 1. Provide pull-down straps or pole hooks for doors more than 84 inches high.

2.5 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

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- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends, and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door specified, with electric motor and factory-rewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Locations: Operator location indicated for each door.
 - 1. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
- D. Electric Motors: Comply with NEMA requirements.
 - 1. Electrical Characteristics:
 - a. Phase: Single phase.
 - b. Volts: 208 V.
 - c. Hertz: 60.
 - 2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
 - 3. Motor Size: Minimum size, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 - 4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 - 5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

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- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
 - 1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
- G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
 - 1. Interior-Units full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - 2. Exterior-Units full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.7 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACME Rolling Doors.
 - b. Alpine Overhead Doors, Inc.
 - c. Cookson Company.
 - d. Cornell Iron Works, Inc.
 - e. Lawrence Roll-Up Doors, Inc.
 - f. McKeon Rolling Steel Door Company, Inc.
 - g. Metro Door.
 - h. Overhead Door Corporation.

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i. QMI Security Solutions.

- B. Operation Cycles: Not less than 10,000.
 - 1. Include tamperproof cycle counter.
- C. Curtain R-Value: 6.0 deg F x h x sq. ft./Btu.
- D. Door Curtain Material: Galvanized steel.
- E. Door Curtain Slats: Flat profile slats of 1-1/2-inch center-to-center height.
 - 1. Vision Panels: Approximately 10- by 1-5/8-inch openings spaced approximately 2 inches apart and beginning 12 inches from end guides; in three rows of slats at height indicated on Drawings; installed with insulated vision-panel glazing.
 - 2. Insulated-Slat Interior Facing: Metal.
- F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise. Provide removable post(s) and jamb guides where shown on Drawings.
- G. Hood: Match curtain material and finish.
 - 1. Shape: Round.
 - 2. Mounting: Face of wall.
- H. Locking Devices: Equip door with locking device assembly.
 - 1. Locking Device Assembly: Cremona type, both jamb sides locking bars, operable from inside and outside with cylinders.
- I. Electric Door Operator:
 - 1. Usage Classification: Standard duty, up to 60 cycles per hour.
 - 2. Operator Location: Front of hood.
 - 3. Motor Exposure: Interior.
 - 4. Emergency Manual Operation: Push-up type.
 - 5. Obstruction-Detection Device: Automatic photoelectric sensor.
 - 6. Remote-Control Stations: Interior and Exterior.
 - 7. Other Equipment: Audible and visual signals.
- J. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

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- C. Adjust seals to provide weathertight fit around entire perimeter.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

087100-01 DOOR HARDWARE SCHEDULE NOTES

1.	Locks / Latches: L1 L1A L2 L3 L4	Type: Perimeter Lock: Cylinder: Office Lock: Privacy Lock: Storeroom Lock:	Manufacturer / Model # Best / 45H-7-S-15-AB-626-SH-S6-VT Best 1E-74-C4-RP3-626 Best / 93K-7-UA-15-S3-626-SH Best / 93K-7-L-15-S3-626-SH Best / 93K-7-D-15-S3-626-SH	Keyed both sides
2.	Hinges: H1	Manufacturer:	McKinney HT2714-4.5 X 4.5 (1.5 pair)	
3.	Closers: C1	Manufacturer:	Norton 7574-ST-DA-626	
4.	Stop / Holders: HS1	Manufacturer: Wall Bumper	Trimco / Glynn-Johnson / Ives 1270CXPV (Trimco)	
5.	Weatherstripping: WS1 WS2 WS3 WS4 WS5	Manufacturer:	Pemko 305CR (Anodized satin at head, and jamb) 3151N (Anodized satin bottom sweep) (Torx pin-head screws) 2005AV (Threshold) NOT USED NOT USED 411 ARL (automatic door bottom) 315CR (sound gasket)	
6.	Miscellaneous: M1	Manufacturer: Silencers	As Noted 1229A (Trimco)	

DOOR HARDWARE SCHEDULE

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DOOR NO.	ROOM NAME	LOCK	MONITORING	HINGE	CLOSER	STOP / HOLDER	PUSH / PULL	WEATHER STRIPPING	MISC.	COMMENTS
100A	Shop Area	L1	----	H1	C1	----	----	WS1	M1	
100B	Shop Area	L1	----	H1	C1	----	----	WS1	M1	
100C	Shop Area	L1	----	H1	C1	----	----	WS1	M1	
100D	Shop Area	L1A	----	H1	----	----	----	----	----	Overhead Coiling Door
100E	Shop Area	L1A	----	H1	----	----	----	----	----	Overhead Coiling Door
100F	Shop Area	L1A	----	H1	----	----	----	----	----	Overhead Coiling Door
100G	Shop Area	L1A	----	H1	----	----	----	----	----	Overhead Coiling Door
100H	Shop Area	L1A	----	H1	----	----	----	----	----	Overhead Coiling Door
100I	Shop Area	L1A	----	H1	----	----	----	----	----	Overhead Coiling Door
101A	Office	L2	----	H1	----	----	----	WS4, WS5	----	
101B	Office	L2	----	H1	----	----	----	WS4, WS5	----	
102A	Vestibule	L1	----	H1	C1	----	----	WS1	----	
102B	Vestibule	L2	----	H1	C1	HS1	----	----	M1	
103A	Toilet	L3	----	H1	C1	HS1	----	WS4, WS5	----	
104A	Toilet	L3	----	H1	C1	HS1	----	WS4, WS5	----	
105A	Staff Breakroom	L4	----	H1	C1	----	----	----	M1	
106A	Compressor	L4	----	H1	C1	----	----	WS4, WS5	----	

ABBREVIATIONS

--- - NO FINISH WORK AT THIS LOCATION
 AFF - ABOVE FINISH FLOOR
 EM - ENTRY MAT MATERIAL
 EXP-STRUCT - EXPOSED TO STRUCTURE
 FACT - FACTORY FINISH
 GYP BD - GYPSUM BOARD
 LIN-X - LINOLEUM / TYPE / COLOR
 MTL - METAL

P-X - PAINT / COLOR
 PLYWD - PLYWOOD
 RB - 4" HIGH RESILIENT
 BASE U.N.O.
 SAT - SUSPENDED
 ACOUSTICAL TILE
 SEAL - SEALED CONCRETE

GENERAL NOTES

1. SEE DRAWINGS FOR SPECIFIC FINISH LOCATIONS
2. PROVIDE RESILIENT TRANSITION MOULDINGS AT ALL FLOORING MATERIAL TRANSITIONS U.N.O.

KEY NOTES

1. PROVIDE LATEX-BASED EPOXY PAINT ON ALL SURFACES TO BE PAINTED
2. ALL SHEET FLOORCOVERING SEAMS TO BE HEAT WELDED
3. INSTALL 3/4" PLYWD FROM FIN FLR TO 8'-0" AFF @ EXP-STRUCT WALLS ONLY, PAINT

SECTION 090000 - ROOM FINISH SCHEDULE										
Okanogan County Public Works Shop Buildings										
ROOM #	ROOM NAME	FLOOR	BASE	CEILING	CEILING HEIGHT AFF	WALLS				NOTES
						NORTH	EAST	SOUTH	WEST	
100	SHOP AREA	SEAL	---	EXP-STRUCT	VARIES	EXP-STRUCT GYP BD P-1 PLYWD P-1	EXP-STRUCT GYP BD P-1 PLYWD P-1	EXP-STRUCT PLYWD P-1	EXP-STRUCT GYP BD P-1 PLYWD P-1	3
101	OFFICE	LIN-1A	RB	SAT	8'-0"	P-1	P-1	P-1	P-1	
102	VESTIBULE	EM	RB	SAT	8'-0"	P-1	P-1	P-1	P-1	
103	TOILET	LIN-2	6" HIGH LIN-2	SAT	8'-0"	P-1	P-1	P-1	P-1	1, 2
104	TOILET	LIN-2	6" HIGH LIN-2	SAT	8'-0"	P-1	P-1	P-1	P-1	1, 2
105	STAFF BREAKROOM	LIN-1A	RB	SAT	8'-0"	P-1	P-1	P-1	P-1	
106	COMPRESSOR	SEAL	RB	SAT	8'-0"	P-1	P-1	P-1	P-1	1
201	STORAGE MEZZANINE	MTL FACT	MTL FACT	EXP-STRUCT	VARIES	EXP-STRUCT	MTL FACT	MTL FACT	EXP-STRUCT	

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SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATION SUBMITTALS

- A. Evaluation Reports: From ICC-ES.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.
- B. Studs and Runners: ASTM C 645, steel studs and runners.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 22 gauge.
 - b. Depth: 3-1/2 inches.
- C. Slip-Type Head Joints: At top of wall under structure, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

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2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) MBA Building Supplies; FlatSteel Deflection Track.
 - 3) Steel Network Inc. (The); VertiClip SLD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
 - 5) Telling Industries; Vertical Slip Track.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: 24 gauge.
- E. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Minimum Base-Metal Thickness: 22 gauge.
 2. Depth: 7/8 inch.

2.2 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), non-perforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs as follows:
 - a. Single-Layer Application: 24 inches o.c. unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

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3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

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SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Interior gypsum board.
- 2. Texture finishes.

- B. Related Requirements:

- 1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

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

- B. Samples: For the following products:

- 1. Trim Accessories: Full-size Sample in six-inch long length for each trim accessory indicated.
- 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

- 1. Install mockups for the following:

- a. Each level of gypsum board finish indicated for use in exposed locations.
- b. Each texture finish indicated.

- 2. Apply or install final decoration indicated, including painting and wall coverings, on exposed surfaces for review of mockups.
- 3. Simulate finished lighting conditions for review of mockups.
- 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturers written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.
 - 4. Lafarge North America Inc.
 - 5. National Gypsum Company.
 - 6. PABCO Gypsum.
 - 7. Temple-Inland.
 - 8. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.

2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

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1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. L-Bead: L-shaped; exposed long flange receives joint compound.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Pre-filling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- D. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Pecora Corporation; AC-20 FTR.
 - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - e. USG Corporation; SHEETROCK Acoustical Sealant.

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2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
- B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; ProRoc Easi-Tex Spray Texture.
 - b. National Gypsum Company; Perfect Spray EM Texture.
 - c. USG Corporation; BEADEX FasTex Wall and Ceiling Spray Texture.
 2. Texture: Orange Peel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- C. Locate edge and end joints over supports. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- D. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- E. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Install sound attenuation blankets at all walls except exterior walls, before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

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3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: All vertical surfaces noted unless otherwise indicated.
- B. Single-Layer Application:
 - 1. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturers' written instructions.
- B. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. L-Bead: Use where required.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required, to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Pre-fill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Concealed areas and where indicated.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099100 "Painting."

3.6 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

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- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact, with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and over-spray to prevent damage according to texture-finish manufacturer's written recommendations.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

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 acoustical panels and exposed suspension systems for ceilings, including hangers, clips, and other ceiling attachment devices.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Sprinklers.
 - 4. Perimeter moldings.
- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.

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1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels, equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized, moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

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: Comply with ASTM E 1264 for Class A materials.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

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- C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.
- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS SAT-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Interiors; Fifth Avenue, fissured No. 586 or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. Chicago Metallic Corporation.
- B. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 - 2. Pattern: CD (perforated small holes and fissured).
- C. Color: White.
- D. LR: Not less than 0.80.
- E. NRC: Not less than 0.55.
- F. CAC: Not less than 35.
- G. Edge/Joint Detail: Square.
- H. Thickness: 5/8 inch.
- I. Modular Size: 24 by 48 inches.
- J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

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- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated.
1. Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

2.5 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Interiors; DX/DXL or comparable product by one of the following:
1. Armstrong World Industries, Inc.
 2. CertainTeed Corp.
 3. Chicago Metallic Corporation.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
1. Structural Classification: Intermediate-duty system.
 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 3. Face Design: Flat, flush.
 4. Cap Material: Steel cold-rolled sheet.
 5. Cap Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Interiors or comparable product by one of the following:
1. Armstrong World Industries, Inc.
 2. CertainTeed Corp.
 3. Chicago Metallic Corporation.
 4. Fry Reglet Corporation.
 5. Gordon, Inc.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with location of hangers at spacing required, to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs.

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- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to long axis of space.
 - 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 - 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Extent of Each Test Area: When installation of ceiling suspension systems has reached 20 percent completion but no panels have been installed.
 - a. When testing discovers hangers and fasteners that do not comply with requirements, testing agency will test those not previously tested until 20, pass consecutively and then will resume initial testing frequency.
- C. Acoustical panel ceiling hangers and fasteners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and

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touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

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SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Resilient base.
- 2. Resilient molding accessories.

B. Related Sections:

- 1. Section 096516.13 "Linoleum Flooring" for linoleum floor coverings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 4 inches long, of each resilient product color, texture, and pattern required.
- C. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. 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.

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1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE RB-1

- A. Resilient Base:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - b. Flexco, Inc.
 - c. Roppe Corporation, USA.
- B. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Type TS (rubber, vulcanized thermoset).
 - 2. Manufacturing Method: Group I (solid, homogeneous).
 - 3. Style: Cove (base with toe).
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.

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- H. Finish: Low luster.
- I. Colors and Patterns: As indicated by manufacturer's designations in Resilient Wall Base and Accessories Color Schedule at the end of Part 3.

2.2 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - b. Flexco, Inc.
 - c. Roppe Corporation, USA.
- B. Description: Transition strips.
- C. Material: Vinyl.
- D. Profile and Dimensions: As required.
- E. Colors and Patterns: As indicated by manufacturer's designations in Resilient Wall Base and Accessories Color Schedule at the end of Part 3.

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 manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. 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.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet or resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturers' written instructions for cleaning and protection of resilient products.

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- 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.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

3.6 RESILIENT WALL BASE AND ACCESSORIES COLOR SCHEDULE

- A. RB-1: Flexco, Flextones, #WF-038 "Outer Banks".
- B. Vinyl Molding / Transition Strips: Flexco, Flextones, #038 "Outer Banks".

END OF SECTION 096513

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SECTION 096516.13 - LINOLEUM FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Linoleum floor tile and sheet flooring.

B. Related Sections:

- 1. Section 096513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with linoleum floor covering.

1.3 ACTION SUBMITTALS

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

- B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

- 1. Show details of special patterns.

- C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each color and pattern of floor covering required.

- 1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

- D. Heat-Welded Seam Samples: For each floor covering product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.

- E. Product Schedule: For floor covering. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

1.5 CLOSEOUT SUBMITTALS

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

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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 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 - 2. Sheet Flooring: Furnish not less than 10 linear feet for every 500 linear feet or fractions thereof, in roll form and in full roll width for each color, pattern, and type of sheet flooring installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.
 - 1. Floor Tile: Store on flat surfaces.
 - 2. Sheet Flooring: Store rolls upright.

1.8 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor coverings during the following time periods:
 - 1. 72 hours before installation.
 - 2. During installation.
 - 3. 72 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 72 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Forbo Flooring, Inc; Marmoleum Composition Tile "MCT" and Marmoleum "Real".
 - 2. Architect accepted equal.

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2.2 LINOLEUM FLOOR COVERING LIN-1 AND LIN-2

- A. Floor Tile: ASTM F 2195, Type I, linoleum floor tile with fibrous backing.
 - 1. Nominal Floor Tile Size: Manufacturer's standard.
- B. Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.
 - 1. Roll Size: In manufacturer's standard length by not less than 78 inches wide.
- C. Seaming Method: Standard and heat welded.
- D. Thickness: 0.08 inch and 0.10 inch.
- E. Colors and Patterns: As indicated by manufacturer's designations in the Linoleum Flooring Color Schedule at the End of Part 3.

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 manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Heat-Welding Bead: Solid-strand product of linoleum floor covering manufacturer.
 - 1. Color: As indicated by manufacturer's designation in the Linoleum Flooring Color Schedule at the End of Part 3.
- D. Integral-Flash-Cove-Base Accessories:
 - 1. Cove Strip: 1-inch radius provided or approved by manufacturer.
 - 2. Cove-Base Cap Strip: Square vinyl or rubber cap provided or approved by manufacturer.
- E. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.

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

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- 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 floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. 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.
- D. Do not install floor coverings until they are same temperature as space where they are to be installed.
 - 1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturers written instructions for installing floor coverings.
- B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent-marking device.
- E. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of floor covering

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installed on covers and adjoining floor covering. Tightly adhere floor-covering edges to substrates that abut covers and to cover perimeters.

- F. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- G. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.4 LINOLEUM FLOOR TILE INSTALLATION

- A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width.
 - 1. Lay floor tiles square with room axis in pattern indicated.
- B. Match floor tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.
 - 1. Lay floor tiles with grain direction alternating in adjacent floor tiles (basket-weave pattern) in pattern of colors and sizes indicated.

3.5 LINOLEUM SHEET FLOORING INSTALLATION

- A. Unroll sheet floorings and allow them to stabilize before cutting and fitting.
- B. Lay out sheet floorings as follows:
 - 1. Maintain uniformity of floor covering direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
 - 3. Match edges of floor coverings for color shading at seams.
 - 4. Avoid cross seams.
 - 5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).
- C. Integral-Flash-Cove Base: Cove linoleum floor covering 6 inches up vertical surfaces. Support floor covering at horizontal and vertical junction with cove strip. Butt at top against cap strip.

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturers written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering 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.
 - 4. Do not wash floor coverings until after time period recommended by manufacturer.

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- C. Protect floor coverings 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, visible adhesive, and surface blemishes from floor coverings before applying liquid floor polish.
 - 1. Seal linoleum as recommended by manufacturer.
 - 2. Use commercially available product acceptable to manufacturer.
 - 3. Coordinate selection of floor polish with Owner's maintenance service.
- E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover floor coverings until Substantial Completion.

3.7 LINOLEUM FLOORING COLOR SCHEDULE

- A. Linoleum Floor Tile color is to match as follows:
 - 1. LIN-1A: Marmoleum Composition Tile "MCT" with Topshield, #629, "Eiger".
- B. Linoleum Sheet Flooring color is to match as follows:
 - 1. LIN-2A: Marmoleum "Real" #2629, "Eiger".
- C. Heat Welding Bead color is to match Marmoleum "Real" #2629, "Eiger".

END OF SECTION 096516.13

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SECTION 099100 - 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. This Section includes surface preparation and field painting of the following:
 - 1. Exposed exterior items and surfaces.
 - 2. Exposed interior items and surfaces.
 - 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Do not paint pre-finished items, concealed surfaces, finished metal surfaces, operating parts, or labels.
- D. Related Sections include the following:
 - 1. Section 055000 "Metal Fabrications" for shop priming and other information.
 - 2. Section 055100 "Metal Stairs" for shop priming and other information.
 - 3. Section 092900 "Gypsum Board" for surface preparation of gypsum board.
 - 4. Section 133419 "Metal Building Systems" for any field painting requirements.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 - 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 - 4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

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1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include fillers and primers.
 - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 - 3. Certification by the manufacturer, that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 - 1. Submit Samples on the following substrates for the Architect's review of color and texture only:
 - a. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.
- C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

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1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package, paint materials in un-opened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
 1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.
- B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
 1. Miller Paint Co. (Miller).
 2. PPG Industries, Inc. (PPG).
 3. Rodda Paint Co. (Rodda).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide fillers, primers, undercoats, and finish-coat materials that are compatible with one, another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

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- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. 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.
- C. Colors: Provide custom colors of the finished paint systems to match the Architect's samples, as referenced in the Painting Color Schedule at the end of Part 3.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturers' written instructions for each substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and re-prime.

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2. 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 backsides of wood, including paneling.
 - c. Back-prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 3. Ferrous Metals: Clean un-galvanized 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 the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
 - 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.
- D. 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 material 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 colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.

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7. Paint backside of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, side edges and interior faces, the same as exterior faces.
 9. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions and sand between applications.
 2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not re-coat surfaces until paint has dried to where it feels firm, does not deform, or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturers recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
- F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Re-coat 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.
- G. 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.
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- 3.4 FIELD QUALITY CONTROL
- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

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1. Engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
 - a. Quantitative material analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Re-coating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
3. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove non-complying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing, or replacing, and repainting, as approved by Architect.
- B. 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 PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

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1. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.
 - 1) Miller: 4160 Devguard Primer.
 - 2) PPG: 4160 Devguard Primer.
 - 3) Rodda: 708225 Barrier III High Solids Primer.
 - b. First and Second Coats: Semi-gloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Miller: 310-5-10 Acrimetal Semi-Gloss.
 - 2) PPG: DevFlex 4216 Acrylic DTM Semi-Gloss.
 - 3) Rodda: 548901 Multi Master Semi-Gloss.

3.8 INTERIOR PAINT SCHEDULE

A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Miller: 220-0-11 Premium PVA Primer.
 - 2) PPG: Speedhide Interior High Build Latex Primer Sealer 6-4.
 - 3) Rodda: 503601 MP Ultra Low VOC Interior Primer/Sealer.
 - b. First and Second Coats: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Miller: 120-5-10 Premium Semi-Gloss Latex.
 - 2) PPG: Diamond 350 Interior Semi-Gloss 1407-0100G.
 - 3) Rodda: 543501 Horizon Semi-Gloss Enamel.
2. Semi-gloss, Waterborne Epoxy Finish: 2 finish coats over a primer.
 - a. Primer: Alkali-resistant, alkyd- or latex-based, interior primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Miller: 620-0-11 Kril Primer-Sealer.
 - 2) PPG: 6-2 Speedhide Interior Latex Sealer Quick-Dry.
 - 3) Rodda: 503601 MP UL Primer.
 - b. First and Second Coats: Semi-gloss, waterborne epoxy applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Miller: 183-5-10 Waterborne Epoxy Coating.
 - 2) PPG: 98-1 Aquapon WB Epoxy.

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3) Rodda: 70504 EcoLogic Waterborne Semi-Gloss Epoxy.

A. Woodwork and Hardboard: Provide the following paint finish systems over new, interior wood surfaces:

1. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoat.

a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

- 1) Miller: 270-0-11 Acro Undercoat.
- 2) PPG: Seal Grip Interior Primer/Finish 17-951.
- 3) Rodda: 502001 Unique Enamel Undercoater.

b. First and Second Coats: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.

- 1) Miller: 101-5-05 Evolution Semi-Gloss Trim.
- 2) PPG: Manor Hall Semi-Gloss 82-500 Series.
- 3) Rodda: 543501 Horizon Semi-Gloss.

A. Ferrous Metal: Provide the following finish systems over interior ferrous metal. Primer is not required on shop-primed items.

1. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.

- 1) Miller: 4160 Devguard Primer.
- 2) PPG: 4160 Devguard Primer.
- 3) Rodda: 708225 Barrier III High Solids Primer.

b. First and Second Coats: Semi-gloss, interior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.

- 1) Miller: 310-5-10 Acrimetal Semi-Gloss.
- 2) PPG: DevFlex 4216 Acrylic DTM Semi-Gloss.
- 3) Rodda: 548901 Multi Master Semi-Gloss.

3.9 PAINTING COLOR SCHEDULE

A. P-1: Color will be a custom color, designed by Architect to be compatible with final colors selected from Metal Building Systems manufacturer chosen.

B. P-2: Color will be a custom color, designed by Architect to be compatible with final colors selected from Metal Building Systems manufacturer chosen.

END OF SECTION 099100

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SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

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1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: **15** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

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2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. A & J Washroom Accessories, Inc.
 2. American Specialties, Inc.
 3. Bobrick Washroom Equipment, Inc.
 4. Bradley Corporation.
 5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
 6. Tubular Specialties Manufacturing, Inc.
- C. Toilet Tissue (Roll) Dispenser TA1:
1. Basis-of-Design Product: Bobrick Classic Series B-2888
 2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
 3. Mounting: Surface mounted.
 4. Operation: Non-Control delivery with theft-resistant spindles.
 5. Capacity: Designed for up to 5-1/4 inch-diameter tissue rolls.
 6. Material and Finish: Stainless steel, No. 4 finish (satin).
- D. Combination Towel (Folded) Dispenser/Waste Receptacle TA2:
1. Basis-of-Design Product: Bobrick Classic Series B-3949
 2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
 3. Mounting: Surface mounted with stainless-steel collar.
 4. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
 5. Minimum Waste-Receptacle Capacity: 12 gal.
 6. Material and Finish: Stainless steel, No. 4 finish (satin).
 7. Liner: Reusable, vinyl waste-receptacle liner.
 8. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.
- E. Liquid-Soap Dispenser TA3:
1. Basis-of-Design Product: Bobrick Classic Series B-2112.
 2. Description: Designed for dispensing soap in liquid or lotion form.
 3. Mounting: Vertically oriented, surface mounted.
 4. Capacity: 40 fl oz.
 5. Materials: Stainless steel, No. 4 finish (satin) for unit body and molded black plastic push button and spout.
 6. Lockset: Tumbler type.
 7. Refill Indicator: Window type.
- F. Grab Bar TA4:
1. Basis-of-Design Product: Bobrick B-6806.99 Series.
 2. Mounting: Flanges with concealed fasteners.
 3. Material: Stainless steel, 0.05 inch thick.

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- a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 - 4. Outside Diameter: 1-1/2 inches.
 - 5. Configuration and Length: As indicated on Drawings.
- G. Seat-Cover Dispenser TA5:
- 1. Basis-of-Design Product: Bobrick Classic Series B-221
 - 2. Mounting: Surface mounted.
 - 3. Minimum Capacity: 250 seat covers.
 - 4. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
 - 5. Lockset: Tumbler type.
- H. Mirror Unit TA6:
- 1. Basis-of-Design Product: Bobrick B-292-2436
 - 2. Frame: Theft resistant stainless-steel angle, 0.05 inch thick.
 - a. Corners: Manufacturer's standard for B-292 Series, welded and ground smooth.
 - 3. Integral Shelf: 5 inches deep.
 - 4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
 - 5. Size: 24 inches wide by 36 inches high.

2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

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3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

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SECTION 123623.13 - PLASTIC-LAMINATE-CLAD 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 plastic-laminate countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, and adhesive for bonding plastic laminate.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in plastic-laminate countertops.
- C. Samples for Verification:
 - 1. Plastic laminates, 4 by 5 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Product Certificates: For each type of product.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than

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installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
 - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.
 - b. Panolam Industries International, Inc.
 - c. Wilsonart International; Div. of Premark International, Inc.
- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by manufacturer's designations, in Plastic-Laminate-Clad Countertops Color Schedule at the end of Part 3.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- F. Core Material: Exterior-grade plywood.
- G. Core Thickness: 3/4 inch.
 - 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

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- H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
 - 1. Plastic Laminate Faced Panel Products (Hardwood Plywood): HPVA HP-1 made with adhesive containing no urea formaldehyde.

2.3 MISCELLANEOUS MATERIALS

- A. Adhesives: Do not use adhesives that contain urea formaldehyde.
- B. Adhesive for Bonding Plastic Laminate: Resorcinol.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- C. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Multipurpose Construction Adhesives: 70 g/L.
 - 3. Structural Wood Member Adhesive: 140 g/L.
 - 4. Architectural Sealants: 250 g/L.

2.4 FABRICATION

- A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and exposed end overhang of 1 inch over base cabinets.
- B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Owner seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop cut openings to maximum extent possible to receive electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

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PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for electrical work and similar items.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semi-exposed surfaces.

3.4 PLASTIC-LAMINATE-CLAD COUNTERTOPS COLOR SCHEDULE

- A. Plastic Laminate PLAM-#: Where this designation is indicated, provide plastic laminate complying with the following type/color/finish numbers:
 - 1. PLAM-1: Nevamar, RK6003T, "Verdicts In", Textured.

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END OF SECTION 123623.13

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SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient-tile entrance mats.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the floor mat, in manufacturer's standard sizes.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats 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. Resilient-Tile Entrance Mats: Full-size tile units equal to 2 percent of amount installed, but no fewer than 10 units.

PART 2 - PRODUCTS

2.1 RESILIENT-TILE ENTRANCE MATS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Shaw Contract Group, Steppin' Out Collection, Welcome II Tile or a comparable product by one of the following:
 - 1. American Floor Products Company, Inc.
 - 2. American Mat & Rubber Company.

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3. Cactus Mat Mfg. Co.
4. Consolidated Plastics Company, Inc.
5. Durable Corporation.
6. Flexco.
7. Mats Inc.
8. Musson Rubber Company.
9. Pawling Corporation; Architectural Products Division.
10. Tennessee Mat Company, Inc.
11. Turtle Plastics.

C. Carpet-Type Tiles: PET Polyester carpet bonded to performance rubber backing to form mats 3/8 or 7/16 inch thick with non-raveling edges.

1. Colors, Textures, and Patterns: As indicated by manufacturer's designations in the Entrance Floor Mats and Frames Color Schedule at the end of Part 3.
2. Tile Size: 24-inch by 24-inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements affecting installation of floor mats.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install surface-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.

3.3 PROTECTION

- A. After completing installation, provide temporary protective cover. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

3.4 ENTRANCE FLOOR MATS AND FRAMES COLOR SCHEDULE

- A. EM-1: Shaw Contract Group, Steppin' Out Collection, #5T031 Welcome II Tile, #31751, "Black Chocolate".

END OF SECTION 124813

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SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Structural-steel framing for building and mezzanine.
2. Metal roof panels.
3. Metal wall panels.
4. Thermal insulation.
5. Doors and frames both interior and exterior.
6. Windows both interior and exterior.
7. Accessories.

B. Related Sections:

1. Section 083323 "Overhead Coiling Doors."

1.3 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

1. Structural-steel-framing system.
2. Metal roof panels.
3. Metal wall panels.
4. Insulation and vapor retarder facings.
5. Flashing and trim.
6. Doors.
7. Windows.
8. Accessories.

- B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other work.

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1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 - a. Show provisions for attaching stairs, railings, and mezzanine framing.
 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
 - a. Show roof-mounted items including equipment supports, pipe supports and penetrations and lighting fixtures.
 - b. Show wall-mounted items including doors, windows, and lighting fixtures.
 4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches.
 - a. Flashing and trim.
- C. Samples for Initial Selection: For units with factory-applied color finish.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:
1. Metal Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
 3. Vapor-Retarder Facings: Nominal 6-inch- square Samples.
 4. Windows: Full-size, nominal 12-inch- long frame Samples showing typical profile.
 5. Accessories: Nominal 12-inch- long Samples for each type of accessory.
- E. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.
1. Door Hardware Schedule: Include details of fabrication and assembly of door hardware. Organize schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 2. Keying Schedule: Detail Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- F. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For qualified erector, manufacturer, professional engineer, land surveyor and testing agency.

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- B. Welding certificates.
 - C. Metal Building System Certificates: For each type of metal building system, from manufacturer.
 - 1. Letter of Design Certification: Signed and sealed by a qualified professional engineer licensed in the State of Washington. Include the following:
 - a. Name and location of Project.
 - b. Order number.
 - c. Name of manufacturer.
 - d. Name of Contractor.
 - e. Building dimensions including width, length, height, and roof slope.
 - f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 - g. Governing building code and year of edition.
 - h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
 - i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 - j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
 - D. Erector Certificates: For each product, from manufacturer.
 - E. Manufacturer Certificates: For each product, from manufacturer.
 - F. Material Test Reports: For each of the following products:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop primers.
 - 5. Non-Shrink grout.
 - G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for insulation and vapor-retarder facings. Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.
 - H. Source quality-control reports.
 - I. Field quality-control reports.
 - J. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.
 - K. Warranties: Sample of special warranties.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For metal panel finishes and door hardware to include in maintenance manuals.

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1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the State of Washington.
- B. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.
- C. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- E. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- G. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- H. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- I. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for typical wall metal panel including accessories.
 - a. Size: 48 inches long by 48 inches.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- J. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions.

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2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof penetrations, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.

3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, 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.

1.9 PROJECT CONDITIONS

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

- B. Field Measurements:
 1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions. Anchor bolt installation layout to match that indicated on Structural Foundation Plan.
 2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed

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with fabricating metal panels without field measurements or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.10 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate installation of roof penetrations, which are specified in Section 077200 "Roof Accessories."
- C. Coordinate metal panel assemblies with flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty on Metal 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.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Behlen Mfg. Co., Baker City, Oregon.
 - 2. Butler Manufacturing Company; a BlueScope Steel Company.
 - 3. CBC Steel Buildings; Division of Magnatrac Corp., California.
 - 4. Pacific Building Systems, Woodburn, Oregon.
 - 5. VP Buildings; a United Dominion Company.
 - 6. Web Steel Buildings NW of Washington.

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2.2 METAL BUILDING SYSTEMS

- A. Description: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
 - 1. Provide metal building system of size and with bay spacings, roof slopes, and spans indicated.
- B. Primary-Frame Type:
 - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.
- D. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior-framed (bypass) girts.
- E. Eave Height: As indicated by nominal height on Drawings.
- F. Bay Spacing: As indicated on Drawings.
- G. Roof Slope: 4 inches per 12 inches.
- H. Roof System: Manufacturer's standard vertical-rib, standing-seam metal roof panels with field-installed insulation.
- I. Exterior Wall System: Manufacturer's standard concealed-fastener metal wall panels with field-installed insulation.

2.3 METAL BUILDING SYSTEM PERFORMANCE

- A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Washington, using performance requirements and design criteria indicated.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Design Loads: As indicated on Drawings.
 - 2. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
 - a. Purlins and Rafters: Vertical deflection of 1/180 of the span.
 - b. Girts: Horizontal deflection of 1/240 of the span.
 - c. Metal Roof Panels: Vertical deflection of 1/240 of the span.
 - d. Metal Wall Panels: Horizontal deflection of 1/240 of the span.
 - e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.

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3. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
 - a. Lateral Drift: Maximum of 1/400 of the building height.
 4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.
- C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 1.57 lbf/sq. ft.
- F. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at static-air-pressure difference of 1.57 lbf/sq. ft.
- G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 2.86 lbf/sq. ft.
- H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a wind-load design pressure of not less than 2.86 lbf/sq. ft.
- I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.
- J. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518:
1. Metal Roof Panel Assemblies:
 - a. U-Factor: .50.
 - b. R-Value: R-38.
 2. Metal Wall Panel Assemblies:
 - a. U-Factor: .32.
 - b. R-Value: R-21.
- K. Energy Performance: Provide roof panels with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC.

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2.4 STRUCTURAL-STEEL FRAMING

- A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter and rake beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span and spacing may be acceptable if necessary, to comply with manufacturer's standard, as approved by Architect.
 2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
 3. Frame Configuration: Single gable.
 4. Exterior Column Type: Tapered.
 5. Rafter Type: Uniform depth.
- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
 2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
- C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, pre-painted with coil coating, to comply with the following:
1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- wide flanges.
 - a. Depth: As needed to comply with system performance requirements.
 2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 3. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch diameter, cold-formed structural tubing to stiffen primary-frame flanges.
 4. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
 5. Base or Sill Angles: Minimum 3-by-2-inch zinc-coated (galvanized) steel sheet.
 6. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 7. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from structural-steel sheet.

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8. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
 9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- D. Bracing: Provide adjustable wind bracing as follows:
1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum 1/2-inch- diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
 2. Cable: ASTM A 475, 1/4-inch- diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
 3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
 4. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 5. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 6. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.
 7. Bracing: Provide wind bracing using any method specified above, at manufacturer's option.
- E. Bolts: Provide plain-finish bolts for structural-framing components that are primed, or finish painted. Provide hot-dip galvanized bolts for structural-framing components that are galvanized.
- F. Materials:
1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
 3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
 4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
 6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70.
 7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80; with G60 coating designation; mill phosphatized.
 8. Metallic-Coated Steel Sheet Pre-Painted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80; with G90 coating designation.
 - b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 50 or 80; with Class AZ50 coating.

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9. Steel Joists: Manufactured according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated and required for secondary framing.
 10. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
 - a. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
 11. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - a. Finish: Plain.
 12. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with spline ends; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.
 13. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with spline ends.
 - a. Finish: Plain.
 14. Un-Headed Anchor Rods: ASTM F 1554, Grade 36.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 heavy-hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM F 436 hardened carbon steel.
 - e. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
 15. Headed Anchor Rods: ASTM F 1554, Grade 36.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 heavy-hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM F 436 hardened carbon steel.
 - e. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
 16. Threaded Rods: ASTM A 193/A 193M.
 - a. Nuts: ASTM A 563 heavy-hex carbon steel.
 - b. Washers: ASTM F 436 hardened carbon steel.
 - c. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- G. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
1. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.
 2. Prime galvanized members with specified primer after phosphoric acid pretreatment.

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3. Primer: SSPC-Paint 15, Type I, red oxide.

2.5 METAL ROOF PANELS

- A. Vertical-Rib, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.

1. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch nominal thickness.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from zinc-coated (galvanized) steel, aluminum-zinc alloy-coated steel, or stainless-steel sheet.
3. Joint Type: Mechanically seamed, folded according to manufacturer's standard.
4. Panel Coverage: 16 inches.
5. Panel Height: 2 inches.
6. Uplift Rating: UL 90.

- B. Materials:

1. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
 - b. Surface: Embossed finish.

- C. Finishes:

1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
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.

2.6 METAL WALL PANELS

- A. Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and flush surface; with flush joint between panels; with 1-inch-wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side-laps.

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1. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch nominal thickness.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
2. Panel Coverage: 16 inches.
3. Panel Height: 3 inches.

B. Materials:

1. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
 - b. Surface: Embossed finish.

C. Finishes:

1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
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.

2.7 THERMAL INSULATION

- A. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch- wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
 1. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm when tested according to ASTM E 96/E 96M, Desiccant Method.
 - a. Composition: White polypropylene film facing and fiberglass-polyester-blend fabric backing.
- B. Retainer Strips: 0.025-inch nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.
- C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

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2.8 DOORS AND FRAMES

- A. Swinging Personnel Doors and Frames both Interior and Exterior: Metal building system manufacturer's standard doors and frames; prepared and reinforced at strike and at hinges to receive factory- and field-applied hardware according to BHMA A156 Series.
1. Steel Doors: 1-3/4 inches thick; fabricated from 0.040-inch nominal-thickness, metallic-coated steel face sheets; of seamless, hollow-metal construction; with 0.064-inch nominal-thickness, inverted metallic-coated steel channels welded to face sheets at top and bottom of door.
 - a. Design: Flush panel.
 - b. Core: Polyurethane foam with U-factor rating of at least 0.07 Btu/sq. ft. x h x deg F.
 2. Steel Frames: Fabricate 2-inch- wide face frames from 0.064-inch nominal-thickness, metallic-coated steel sheet.
 - a. Type: Factory welded.
 3. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold- or hot-rolled steel sheet.
 4. Hardware:
 - a. Provide hardware for each door leaf, as follows:
 - 1) Hinges: BHMA A156.1. Three antifriction-bearing, standard-weight, full-mortise, stainless-steel or bronze, template-type hinges; 4-1/2 by 4-1/2 inches, with nonremovable pin.
 - 2) Lockset: BHMA A156.2. Mortise, with lever handle type.
 - 3) Threshold: BHMA A156.21. Extruded aluminum.
 - 4) Silencers: Pneumatic rubber; three silencers on strike jambs of single door frames and two silencers on heads of double door frames.
 - 5) Closer: BHMA A156.4. Surface-applied, standard-duty hydraulic type.
 - 6) Weather Stripping: Vinyl applied to head and jambs, with vinyl sweep at sill.
 5. Anchors and Accessories: Manufacturer's standard units, galvanized according to ASTM A 123/A 123M.
 6. Fabrication: Fabricate doors and frames to be rigid; neat in appearance; and free from defects, warp, or buckle. Provide continuous welds on exposed joints; grind, dress, and make welds smooth, flush, and invisible.
- B. Materials:
1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications, at interior door.
 2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation, at exterior doors.
- C. Finishes for Personnel Doors and Frames:
1. Prime Finish: Factory-apply manufacturer's standard primer immediately after cleaning and pretreating.

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- a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
2. Factory-Applied Paint Finish: Manufacturer's standard, complying with SDI A250.3 for performance and acceptance criteria.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.9 WINDOWS

A. Aluminum Windows both Interior and Exterior: Metal building system manufacturer's standard, with self-flashing mounting fins, and as follows:

1. Type, Performance Class, and Performance Grade: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 and as follows:
 - a. Single-Hung Units: H-LC25.
2. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.064-inch thickness at any location for main frame and sash members.
 - a. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
3. Fasteners, Anchors, and Clips: Nonmagnetic stainless steel, aluminum, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.
 - a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.
4. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:
 - a. Lift handles for single-hung units.
5. Insect Screens: Provide removable insect screen on each operable exterior sash, with screen frame finished to match window unit, and as follows:
 - a. Aluminum Wire Fabric: 18-by-18, 18-by-16, or 18-by-14 mesh of 0.013-inch-diameter, coated aluminum wire; complying with FS RR-W-365, Type VII.

B. Glazing both Interior and Exterior:

1. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear), 3 mm thick.
2. Tinted Float Glass: ASTM C 1036, Type I, Quality-Q3, Class 2, 3 mm thick.

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- a. Tint Color: Manufacturer's standard color.
 - 3. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of 2.5-mm-thick clear float glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 4. Factory-Glazed Fabrication: Glaze window units in the factory to greatest extent possible and practical for applications indicated.
- C. Finish:
- 1. Baked-Enamel Finish: Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 0.7 mil, medium gloss.
 - a. Color: As selected by Architect from manufacturer's full range.

2.10 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
- 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.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
- 1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 - 2. Cleats: Manufacturer's standard, mechanically seamed cleats formed from stainless-steel sheet or nylon-coated aluminum sheet.
 - 3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 4. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or pre-molded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 - 5. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
- 1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.

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2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or pre-molded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Formed from 0.022-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim 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.
 2. Opening Trim: Formed from 0.034-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Pipe Flashing: Pre-Molded, EPDM pipe collar with flexible aluminum ring bonded to base.
- F. Materials:
1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 - a. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless-steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
 - b. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless-steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM sealing washers bearing on weather side of metal panels.
 - c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.
 4. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape of manufacturer's standard size.
 - b. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

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2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate product.
- B. Special Inspector: Contractor shall engage a qualified special inspector to perform the following tests and inspections and to submit reports. Special inspector will verify that manufacturer maintains detailed fabrication and quality-control procedures and will review the completeness and adequacy of those procedures to perform the Work.
 - 1. Special inspections will not be required if fabrication is performed by manufacturer registered and approved by authorities having jurisdiction to perform such Work without special inspection.
 - a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.
- C. Testing: Test and inspect shop connections for metal buildings according to the following:
 - 1. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

2.12 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 - 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 - 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 - 1. Make shop connections by welding or by using high-strength bolts.

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2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing.
 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
 2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

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3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit openings such as doors and windows.
 - 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, and other penetrations of roof and walls.
- H. Steel Joists and Joist Girders: Install joists, girders, and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.

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2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
5. Install and connect bridging concurrently with joist erection before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

I. Bracing: Install bracing, in roof and sidewalls, where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.

1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

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- D. Joint Sealers: Install gaskets, joint fillers, and sealants, where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints, where recommended by metal panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
1. Install ridge caps as metal roof panel work proceeds.
 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
1. Install clips to supports with self-drilling or self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
 6. Provide metal closures at peaks and rake edges and each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 2. Shim or otherwise plumb substrates receiving metal wall panels.
 3. When two rows of metal panels are required, lap panels 4 inches minimum.

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4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
 6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 7. Install screw fasteners in predrilled holes.
 8. Install flashing and trim as metal wall panel work proceeds.
 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and on location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
1. Set vapor retarder toward warm side of construction unless otherwise indicated.
 2. Tape joints and ruptures in vapor retarder and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
 3. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following installation method:
1. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
 2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight, and taut, nesting with secondary framing to hold insulation in place.
- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight, and taut, nesting with secondary framing to hold insulation in place.
- D. Board Wall Insulation: Extend board insulation in thickness indicated to cover entire wall. Hold in place by metal wall panels fastened to secondary framing. Comply with manufacturers' written instructions.
1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight, and taut, nesting with secondary framing to hold insulation in place.

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3.8 DOOR AND FRAME INSTALLATION

- A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.
- B. Personnel Doors and Frames: Install doors and frames according to SDI A250.8. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:
 - 1. Between Doors and Frames at Jambs and Head: 1/8 inch.
 - 2. At Door Sills with Threshold: 3/8 inch.
 - 3. At Door Sills without Threshold: 3/4 inch.
- C. Door Hardware: Mount units at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 1. Install surface-mounted items after finishes have been completed on substrates involved.
 - 2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 - 4. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

3.9 WINDOW INSTALLATION

- A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.
 - 1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Mount screens directly to frames with tapped screw clips.

3.10 ACCESSORY INSTALLATION

- A. General: 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 roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

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3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. 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 excessive oil-canning, 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 to result in 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 with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type 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 deep, filled with mastic sealant (concealed within joints).
- C. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Inspection of fabricators.
 2. Steel construction.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections:
1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

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3.12 ADJUSTING

- A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.
- B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.
- C. Windows: Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and at weather stripping to ensure smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.13 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.
 - 1. Immediately before final inspection, remove protective wrappings from doors and frames.
- F. Windows: Clean metal surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Clean factory-glazed glass immediately after installing windows.

END OF SECTION 133419

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SECTION 220000 – PLUMBING GENERAL REQUIREMENTS (Performance Specification)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Components and requirements for Design/Build Plumbing systems.

B. Related Requirements:

1. Division 26 "Electrical" for electrical power connections required for any plumbing equipment.
2. Coordinate all Plumbing Work with Civil Work referenced in Documents.

1.2 DESCRIPTION

- A. A completed operating installation of all Plumbing systems specified and required shall be provided. All installations shall be in strict compliance with the Specifications, Drawings, General Conditions and Contract terms, all applicable current State and Local Codes and Ordinances. In case of conflicts, the quality deemed best by the Owner's Representative will govern.
- B. This Work is Design/Build and Documents are to be stamped by an Engineer licensed in the State of Washington.

1.3 SCOPE OF WORK

A. Work includes, but is not limited to:

1. Provide all labor, materials, equipment, tools, and perform all work to furnish the complete design and construction for plumbing of the Project.
2. Design, construct and coordinate the complete system to meet the intent of the architectural design documents. Install work within the initial space accommodations or make other provisions at no additional cost the Owner and maintain the initial architectural and structural integrity.
3. Provide electrical load information to Electrical Subcontractor. Electrical Contractor to connect all plumbing equipment, as required. Control wiring is the responsibility of the Plumbing Contractor. See Division 26.
4. Subcontractors are required to fully coordinate their work with other subcontractors. Any cost of remedy for lack thereof is the responsibility of these Subcontractors.
5. Complete work expeditiously and within requirements of published project schedule(s) of Architect and Owner.
6. Obtain and pay for all permits and pay all fees required by local jurisdictional authorities and utilities.
7. Arrange for and schedule all tests required by local jurisdictional authorities and utilities.
8. The Architect will act on the Owner's behalf as advisors on technical matters of interest to the Owner. The obligations of the Design/Build Contractor are in no way alleviated by the Architect's involvement on the project. The obligation, responsibility and/or liability of the Design/Build Contractor are in no way reduced or diminished by the Architect's review of the design or installation.

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B. Related Work Specified Elsewhere:

1. Advise the General Contractor of all concrete work associated with the installation of the mechanical systems. The General Contractor will provide the concrete work utilizing information provided by the Design/Build Contractor.

1.4 QUALITY ASSURANCE

A. Applicable Codes and Standards:

1. Comply with all Federal, State, City and other applicable codes and ordinances including applicable provisions of following:
 - a. International Building Code (2018 IBC)
 - b. Uniform Plumbing Code (2018 UPC)
 - c. NFPA
2. If any conflict arises between the Specifications or codes and ordinances, immediately notify the Architect. Do not deviate from the Drawings and Specifications nor install any work which may be, in conflict with codes and ordinances until the conflict is resolved and the solution approved by the Architect.

B. Materials: Except as otherwise permitted by specification designation, provide new materials of standard make and current manufacture. Where applicable, conform to ASME, ASTM, NFPA or other requirements and have UL listing. Select Equipment to fit space provided.

C. Workmanship: Run piping parallel to building, keep as inconspicuous as possible, and grade evenly. Set equipment plumb and true with easy access for maintenance. Offset piping, as required to provide for proper and necessary clearances.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is legally qualified to practice in jurisdiction where Project is located and 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.

1.5 SCHEDULE OF VALUES

A. Submit typed schedule on Contractor's standard form or electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 30 days after date established in Notice to Proceed.

C. Format: Divide value of work into the following categories: Include within each line item, a directly proportional amount of Contractor's overhead and profit.

1. Plumbing Labor.
2. Plumbing Materials.

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1.6 SUBMITTALS

- A. Drawings and Calculations: Submit for review in accordance with Section 013300.
 - 1. Provide an engineer stamped, coordinated set of construction documents ready for permit submission to the building department containing as a minimum the following:
 - a. Equipment schedule sheet(s).
 - b. Equipment and piping location plans drawn at 1/4" = 1'-0" scale. Show on plans evidence of coordination with all other construction trades.
 - c. Miscellaneous, details and large-scale plans and sections necessary to show coordination.
- B. Submittals before construction begins: Submit for review in accordance with Section 013300.
 - 1. Plumbing Fixtures and Trim.
- C. Record Drawings: Submit for review in accordance with Section 017839.
 - 1. Deviations: Record changes to plumbing systems, including locations, sizes, or arrangement.
 - 2. Location of Concealed Work: Locate accurately to scale and dimension from building features and concealed piping.
 - 3. Location of Valves and Cleanouts: Locate accurately to scale and dimension from building features.

1.7 COORDINATION

- A. Maintain qualified supervisory personnel on job to coordinate work and space utilization with other trades involved. Supervisor must be completely familiar with operation and requirements of equipment being installed and be responsible for job during entire construction period. Prior to request for final review, be certain that equipment and controls are functioning properly.

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PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Plumbing Sizing Criteria:

1. Domestic Water: Size per 2018 Oregon Plumbing Specialty Code, Appendix "A", using 5 psi per 100' drop, 8 f.p.s. maximum velocity for cold water and 5 f.p.s. for hot water as limiting criteria.

2.2 GUARANTEES

- A. Submit a single guarantee stating that all portions of the work are in accordance with Contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one (1) year from date of substantial completion, except that where guarantees or warranties for longer terms are specified, such longer term to apply within 24 hours after notification, correct any deficiencies which occur during the guarantee period at no additional cost to the Owner, all to the satisfaction of the Owner and Architect.
- B. Be responsible for all leaks in all pipes for a period of one (1) year from date of acceptance of work. Repair all such leaks, at no cost to Owner, within 24 hours of notice by the Owner. Repair leaks which occur prior to the completion of this Subcontract at once. Be responsible for any damage caused by such leaks and repair thereof and reimburse Owner for all expenses incurred.

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2.3 OPERATION AND MAINTENANCE MANUALS

- A. Provide Operation and Maintenance manuals in accordance with Section 017823. As minimum provide the following.
 - 1. Manufacturer's literature on all items of equipment.
 - 2. Operating and maintenance instructions.
 - 3. Wiring and temperature control diagrams.

PART 3 - EXECUTION

3.1 BUILDING COMMISSIONING

- A. Provide startup, test, and adjustment of each item of plumbing equipment and of complete system by qualified field personnel.
- B. During final review, demonstrate system operation to Owner that each item of equipment is operating as designed, and that adjusting has been accomplished in accordance with Specifications.

END OF SECTION 220000

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SECTION 221000 - PLUMBING PIPING (Performance Specification)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide material, labor and complete system described and shown.

1.2 QUALITY ASSURANCE

A. References:

1. American Society for Testing Materials (ASTM) publications:
 - a. B32 Solder Metal
 - b. B88 Seamless Copper Water Tube
2. National Electrical Manufacturers Association (NEMA).
3. International Conference of Building Officials (ICBO).
4. Underwriters' Laboratories, Incorporated (UL).

B. Materials:

1. Except as otherwise permitted by specification designation, provide new materials of standard make and current manufacture. Where applicable, conform to ASME, ASTM, NFPA or other requirements and have UL listing. Select Equipment to fit space provided.

C. Workmanship:

1. Run piping parallel to building, keep as inconspicuous as possible, and grade evenly. Set equipment plumb and true with easy access for maintenance. Offset piping, as required to provide for proper and necessary clearances. Provide adequate clearances for repair and service of mechanical equipment.

D. Coordination:

1. Maintain qualified supervisory personnel on job to coordinate work and space utilization with other trades involved. Supervisor must be completely familiar with operation and requirements of equipment being installed and be responsible for job during entire construction period. Prior to request for final review, be certain that equipment and controls are functioning properly.

PART 2 - PRODUCTS

2.1 IDENTIFICATION

- A. Valves: Provide numbered brass disc attached to each valve. Valve numbers in separate series for each section of specification.

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- B. Piping: Band all piping with heat resistant adhesive backed PVC material, width, frequency, color and lettering to conform to ANSI A13.1. Indicate fluid in piping and direction of flow. Provide in mechanical, fan and storage rooms and exposed in other finished areas at each valve, each change of direction, 20 feet apart on straight runs and at locations where piping enters or leaves space. In concealed areas, band at valves, pipe junctions and 40 feet apart on straight runs.

2.2 PIPE AND FITTINGS

A. Domestic Water:

- 1. Pipe - Type L hard drawn copper tubing above ground, Type K soft drawn buried below buildings, Type L soft drawn buried beyond 5 feet from the building perimeter, conforming to ASTM B88-2003 specifications or as noted.
- 2. Fittings - Standard wrought copper solder type for 150 psi service conforming to ASME B16.22-(R05) specifications.
- 3. Unions - All brass.
- 4. Solder - Tin/Antimony conforming to ASTM B32-2004 specifications.
- 5. Use clear-flow dielectric waterway joints between copper, and steel piping.

B. Domestic Water 1" and smaller:

- 1. Pipe – PEX-a Polyethylene tube with cross-linked molecular network structure (using the Engel Method) conforming to ASTM F876-2005 & F877-2005 specifications with 100 psi rating at 180°F and 25-year manufacturer's limited warranty. AQUAPEX by Uponor, or as noted.
- 2. Fittings - Brass insert fitting with PEX ring and expansion tool. ProPEX by Uponor.
- 3. Manifolds – Type L copper manifolds with PEX ring and expansion tool. ProPEX Copper by Uponor.
- 4. Tube ends for Stop Valves – Factory assembled Type L copper tube section with brass insert adaptor for use with standard compression fitting attached Stop Valve. ProPex by Uponor Copper Stub Ell or Copper Straight Stub.

C. Drain, Waste and Vent:

- 1. Pipe and fittings: Acrylonitrile-Butadiene-Styrene (ABS) Plastic drain, waste, and vent conforming to ASTM D2661-2006.
- 2. Provide tracer wire 1' above all underground waste and sewer lines outside building.

2.3 VALVES:

A. Minimum working pressure rating 150 psig W.O.G.

B. Manufacturer: Apollo, Hammond, Jenkins, Milwaukee, Nibco, or approved equal.

C. General Valve Requirements: Hammond valve numbers given to establish quality.

1. Gate Valve:

- a. Two inch (2") and Smaller: Bronze body, inside screw, rising stem, solid disk wedge, screwed bonnet, No. IB640.

2. Globe Valve:

- a. Two inch (2") and Smaller: Teflon disc, bronze body, bronze trim, No. IB413.

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3. Check Valve:
 - a. One inch (1") and Smaller: Bronze body, horizontal swing, screwed bonnet, renewable disc, No. IB904.
 - b. One and a quarter (1¼") and Larger: Iron body, horizontal swing, bolted bonnet, renewable seat and disc, flanged, No. IR1124.
 - c. Non-Slam: Wafer style, spring loaded, silent check valve. Hammond IR9253, or Jergens, Victaulic, Metraflex, Val-matic. Use on pump discharges.
4. Ball Valves: Bubble tight shutoff, seats glass filled teflon to minimize seat cold flow.
 - a. One inch (1") and smaller: Full port, 150 psig W.O.G., suitable for 220 F operation, two piece screwed type bronze body, No. 8901/8911.
 - b. One and a quarter (1¼") and larger: Full port, 200 psig W.O.G., suitable for 220 F operation, three piece bolted body allowing replacement of valve assembly without breaking piping, No. 8604/8614.
5. Drain Valves: Hose end gate valve or gate valve with hose connection. Do not use sillcocks in lieu of drain valves.

2.4 PRESSURE REDUCING STATION

- A. Pilot operated regulating valve to automatically control downstream pressure with varying flow rates and upstream pressure.
- B. Provide with stainless steel trim for prolonged low flow rate usage.
- C. Provide with "Y" strainer and flow stabilizer on pilot system.
- D. Watts ACV series.

2.5 STRAINERS

- A. Cast iron body, "Y" pattern strainer, unless noted otherwise, with removable cover and corrosion resisting sediment basket not less than 0.025" thick with total area of perforations 3.3 times cross-sectional area of pipe. Minimum working pressure rating 150 psig W.O.G.
- B. Provide strainer with 1/16" holes for water service, 1/32" for steam service.
- C. Provide blow-down with nipple and ball valve on all strainers over 2" size.

2.6 PAINTING

- A. Check equipment furnished under this contract finished with factory-applied finish. Clean dirty equipment and refinish mars or scratches to original surface and color.
- B. Paint all miscellaneous structural supports, including stands, two coats of machinery enamel, color as selected.
- C. Other painting is specified in Section 099100.

2.7 ELECTRICAL CONNECTIONS

- A. Division 26 specifies wiring, provides disconnect switches, mounts starters and makes line voltage connections to equipment furnished under Division 22, unless noted under specific item.

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2.8 PLUMBING SUPPORT DEVICES

- A. Piping: Provide galvanized hangers and shields for the pipe supported. Provide copper plated hangers and guides in contact with copper pipe. Increase pipe hanger size for insulation such that insulation is continuous thru hanger. Provide 16-gauge insulation shield for 4" and larger pipe and 20 gauge for 3" and smaller. Length of the shield 6 times nominal pipe diameter except minimum length 6 inches. Hanger types permitted are as follows:
1. Clevis - for all pipes - Grinnell Fig. 260.
 2. "J" hanger - for all pipes - Superstrut C-711.
 3. Swivel Ring - for non-insulated pipe - Grinnell Fig. 70.
 4. Swivel Ring w/ Shield - for insulated pipes 2" and smaller - Michigan Hanger Co. No. 103.
 5. Riser Clamps - for steel and iron pipe - Grinnell Fig. 261, for copper pipe - Grinnell Fig. 261c.
 6. Pipe Rolls - Grinnell Fig. 171, provide pipe covering protection saddles for 1-1/2 inch and larger insulated pipe at each roll - Grinnell Fig. 160.
 7. Pipe Guide - Grinnell Fig. 256.
 8. Pipe Anchors - Flexonics AC Series or Fee & Mason Fig. 140 welded to pipe.
 9. Beam clamps - Grinnell Fig. 61.
- B. Trapeze support systems: Hot rolled steel channel with electro-galvanized finish, clips, fasteners, and clamps with matching finish by same manufacturer.
1. For copper pipe provide neoprene strip between pipe and clamp - Superstrut S-716, plastic tape alone is not acceptable.
 2. For insulated pipe provide strap and shield sized for O.D. of insulation - Superstrut C-708 with C-790, universal clamps attached directly to pipe are not permitted.

2.9 ESCUTCHEONS

- A. Provide nickel or chrome plated escutcheons with screws or springs for holding plate in position where pipes penetrate floors and walls.

2.10 ACCESS DOORS

- A. Provide access doors for sheet rocked walls and ceilings with doors flush with finished sheet rock and hinges concealed.
- B. Provide access doors in acoustical tile ceilings with piano type hinge flush with surface of tile. Arrange doors so that tile may be installed on doors without disrupting ceiling pattern.
- C. Provide doors with keyed lock.
- D. Use no door smaller than 12" x 12" for only reach-in access, nor smaller than 24" x 24" where personnel must pass through. Fire rating of door to match surroundings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install where indicated per manufacturer's recommendations.

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3.2 CUTTING AND PATCHING

- A. Cut work as required for installation and patch to match original conditions as directed and approved by Architect. Do not cut structural portion without Architect's approval.
- B. When concrete construction must be penetrated, furnish, and install a pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish. Size sleeve to accommodate pipe insulation. Penetrate concrete construction by core drilling, size to accommodate insulation. Pack annular space between pipe and sleeve or core-drilled hole per Sleeves above.
- C. Prior to cutting any existing work, locate all concealed utilities to eliminate any possible service interruption or damage. Contractor is responsible for repair or replacement of lines or equipment damaged in existing systems.
- D. Coordinate with General Contractor to repair ceilings, walls, and floors.

3.3 DEMOLITION AND SALVAGE

- A. Relocate or reroute any existing Plumbing work, not otherwise noted, in the way of remodeling and new construction and leave in proper operating condition. In case of question consult Architect. Remove exposed, abandoned piping and cap or plug in concealed location.
- B. Equipment removed becomes property of Contractor, with exceptions noted.
- C. Haul debris and material other than equipment from site, unless otherwise arranged.
- D. Coordinate time of removal with General Contractor so that no plumbing equipment or material is damaged or destroyed in general demolition.
- E. If Contractor encounters asbestos, stop work in that area and notify Owner.

3.4 PIPE SUPPORTS

- A. Locate hangers, supports, and accessories to support pipelines, valves, and additional concentrated loads.
- B. Single Pipes: Support horizontal runs of steel and copper pipe under 2" on suitable hangers spaced at not more than 5 feet on centers. Support all steel and copper piping 2" and larger at not more than 10 feet on centers. Support horizontal runs of cast-iron soil pipe at every other joint, unless over 4 feet then support every joint.
 - 1. Independently support piping at equipment, such as duct mounted coils, so that no weight is supported by equipment.
 - 2. Do not spring or bend pipe to fit conditions or to make up joints. Support piping in manner to prevent binding, undue swing, and transmission of vibration to structure. Provide sway bracing where hanger rods are longer than 12" and at maximum spacing of 40 feet.
 - 3. Install hangers for insulated piping outside insulation using high-density section (6# per cubic foot) of insulation and sheet metal shield.
 - 4. Install minimum of one hanger or brace within two (2) feet from each change of direction in piping.

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- C. Trapeze Hangers: Where pipes are clustered, parallel, and in same plane, support by trapeze hangers. Provide rods and channel sized to suit load imposed.

3.5 SLEEVES

- A. Provide sleeves where pipes pass through walls, floors, or ceilings. Make sleeves as follows:
 - 1. In foundations and concrete slabs, use schedule 40 black steel pipe poured in place.
 - 2. In frame or similar construction, use 20-gauge galvanized sheet metal with edges turned 1/2 inch.
- B. Install sleeves flush with surfaces, except in mechanical rooms or on any wet floor where seepage may occur, install 1 inch above floor.
- C. Size sleeves for insulated piping to allow continuous insulation through sleeve.
- D. Where sleeves pass through fire rated assemblies:
 - 1. Pack annular space between pipe and sleeve with intumescent material capable of expanding up to 8 to 10 times when exposed to 250-degree F temperature or higher, UL classified with I.C.B.O., B.O.C.A.I., and S.B.C.C.I. (NRB 243) approved ratings to 3 hours per ASTM E814 (UL1479).
 - 2. Acceptable material: 3M Fire Barrier Caulk, Putty, Strip and Sheet, or Dow Corning fire stop equivalent putty No. 2000 and 2001 foam. Install escutcheon at exposed penetrations to cover sleeve and spacing sealant.

3.6 TYPICAL PIPING

- A. Provide clear-flow dielectric waterway couplings to prevent electrolysis between dissimilar metals, when use of dissimilar metals cannot be avoided in one system.
- B. Provide air vents at high points and where piping turns down in direction of flow.
- C. Close openings in pipes with appropriate caps, plugs, or covers during storage and progress of work to preclude introduction of contaminants.
- D. Slope pipelines and provide low point drains for piping and equipment.
- E. Provide valves and unions adjacent to tanks, batteries of plumbing fixtures and equipment, for disconnect purposes. Install valves with stems vertical wherever possible, and in no case with stems below horizontal.
- F. Provide gate valve and check valve on cold water supply to domestic water make-up connections.
- G. Ream ends of pipe to full diameter.
- H. Provide pipe anchors, swing joints, and expansion compensators as required to control expansion of pipelines.
- I. Reduce pipe sizes using reducing tees or reducing fittings. Bushings not permitted except on tanks and similar equipment.

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- J. Provide escutcheons on pipes passing through walls, floors, and ceilings in finished areas and where piping is in counters, closets, or cabinets, and subject to view when doors are open. Cover pipe sleeve and secure plate in position.
- K. Testing:
 - 1. Test all piping to a pressure equal to 1.5 times the working pressure of the system. Hold test pressure for minimum of 4 hours without leakage. Arrange for the Owner's Representative to witness the tests. Provide written report.
 - 2. Leave piping exposed (unconcealed) for observation during testing. Expose any work that was covered or concealed before testing for the duration of the testing period.
 - 3. Repair leaks & defects discovered during testing with new material and re-test until satisfactory results are obtained.
 - 4. Testing of portions of the entire system is permitted provided clear documentation is included with the test reports showing the extent of the piping under test.

3.7 THREADED PIPE

- A. Cut threads true and of depth of make up properly without leaks.
- B. Make connections to show at least two threads and not more than four threads when tight.
- C. Make up joints with Teflon tape only for domestic water and hydronic systems, as recommended by tape manufacturer, or as specified for individual piping systems.
- D. Use approved type pipe compound for gas and oil piping.

3.8 CLEANING

- A. Clean exposed, un-insulated piping to remove shipping labels, flux, solder drips, pipe dope, dirt, oil, loose scale, or other contaminants.
- B. Thoroughly flush out and clean each piping system. Be aware of obstructions in piping, such as flow control valves, strainers, etc., during cleaning process. Make provisions to handle these items using bypasses, back-flushing, leaving equipment out and installing temporary, connections until piping is clean or whatever is required to accomplish complete cleaning. Clean, ductwork in this contract prior to installation of grilles.

END OF SECTION 221000

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SECTION 222000 – PLUMBING INSULATION (Performance Specification)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section describes specific requirements, products and methods of execution, which relate to insulation of pipes in crawl space.
- B. Provide skilled applicators directly employed and supervised by firm specializing in this type of work.

PART 2 - PRODUCTS

2.1 FIRE RATING OF MATERIALS

- A. Provide insulation products used aboveground in building with burning characteristics not to exceed following, rated according to NFPA 255-1972 "Methods of Test of Surface Burning Characteristics of Building Materials": Flame Spread 25, Fuel Contributed 50, Smoke Developed 50.
- B. Insulation specified for use underground and aboveground away from building, might have other burning characteristics. Use such products only where specifically required.

2.2 INSULATION

- A. Domestic cold and hot water:
 - 1. Sectional glass fiber insulation, thickness as listed below, having thermal conductivity of not over 0.27 at 100° F. Provide white universal vapor barrier jacket with sealing lap.

Minimum Pipe Insulation Requirements

Nominal Pipe Size	1" and less	1¼" to 2"	2½" and larger
Domestic Hot Water	1 inch ¹	1 inch	1.5 inches
Domestic Cold Water	0.5 inch	0.5 inch	0.5 inch

- B. Closed Cell Foam:
 - 1. Closed cell polyolefin (polyethylene) foam insulation designed for service between -165° F and +210° F with a thermal conductivity of 0.24 at 75° F, U.V. stabilized (passes ten year weatherometer test), and suitable for direct burial underground without special protection.
 - 2. IMCOLOCK[®] and IMCOSHIELD by IMCOA.

¹ Piping less than 1" in diameter and less than 12 feet in length may be insulated with 0.5-inch insulation.

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PART 3 - EXECUTION

3.1 GENERAL

A. Piping:

1. Provide continuous insulation through hangers and supports with unbroken vapor seal on cold services. Seal to hanger inserts and to wall, ceiling or floor inserts.
2. Sectional Insulation. Jacket as specified. Neatly apply insulation with joint on top or back of piping. Butt insulation tightly at all side and end joints and at sleeves. Seal longitudinal jacket laps and butt strips smoothly with Benjamin Foster 85-20 or self-seal adhesive. For vapor barrier jacket, seal terminations with Benjamin Foster 30-35.
3. Seal around each joint of all exterior metal-jacketed pipe with silicone mastic.
4. For cold services install continuous insulation and vapor barrier through sleeves, hangers and supports.

B. Fittings and Valves:

1. One (1) inch and smaller, wrap firmly with 1 lb. density glass fiber to match thickness of adjacent insulation and secure with 20-gauge galvanized wire. Coat smooth with insulating cement.
2. Three (3) inches and over, secure segments of molded insulation with 20-gauge galvanized wire. Coat smooth with insulating cement.
3. For hot services finish exposed fittings with glass fabric overlapped smoothly and applied with Benjamin Foster 30-36.
4. For cold services finish with glass fabric imbedded between two 1/16" thick coats of Benjamin Foster 30-35. On exposed fittings add glass fabric overlapped smoothly and applied with Benjamin Foster 30-36. Cover unions same materials as pipe, I.D. equal to O.D. of pipe covering and length three (3) diameters of union covering. Cement ends for vapor seal.
5. Zeston covers approved in place of fabric finish.

3.2 INSULATION JACKET INSTALLATION

- A. Install aluminum jacket sections with lap joint out of view. Install stainless steel bands at each joint, and at midpoint of jacket sections. Mitre jacket for elbows and other fittings.

3.3 FLEXIBLE ELASTOMERIC INSULATION

- A. Neatly mitre all joints, butt and completely seal all joints with adhesive cement.
- B. Provide removable (slit) sections of insulation on all valves, unions and other fittings, which require periodic servicing. Size removable sections with I.D. to fit over piping insulation, secure with stainless steel worm drive hose clamps.
- C. For outside installations coat insulation with protective ultraviolet coating as recommended by manufacturer.

END OF SECTION 222000

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SECTION 224000 - PLUMBING FIXTURES (Performance Specification)

PART 1 - GENERAL

1.1 GENERAL

- A. Provide plumbing fixtures with necessary trim, stops, and traps per manufacturer's installation instructions. Provide fittings and faucets by fixture manufacturer per latest catalog description for specified item, or as noted. Exposed trim polished chrome plated brass. Protect against damage before and after installation. See Plumbing Fixture Schedule in Drawings.
- B. Furnish stops with escutcheon plates at sinks, lavatories, and water closets.
- C. Trim to have replaceable and interchangeable assemblies.
- D. Hot and cold valves open toward center.
- E. Seal inside and around outside edge of floor mounted water closets with black swan plastic putty and anchor solidly.
- F. Prime floor drain trap with Precision Plumbing Products, Inc. mechanical primer. Leave valve accessible for service.
- G. Furnish and install stainless steel Hudee rims where required. Set in white tile cement. On self-rimming units use soft putty or mastic under bowl rim.
- H. Traps: 17 gage chrome plated brass tube. Install with solder bushing into stack and threaded joints for easy maintenance.
- I. Install 3/16" x 8" wide steel plates fastened to the studs for support of wall hung lavatories. Plate to extend one stud beyond each side of fixture.
- J. Fixtures to withstand 150 lb. pressure in any direction without displacement. Install firmly fixed blocking in wall for rigid support of fixture supplies.
- K. For sink sizes first dimension is left to right second dimension is front to back.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Faucets: Chicago, Delta, American Standard, Kohler, Moen, Symmons, T & S, Zurn or as noted.
- B. Fixtures, Vitreous China: American Standard, Briggs, Crane, Kohler, Toto or as noted.
- C. Sinks: Acorn, Elkay, Tabco, Zurn or as noted.
- D. Stops: McGuire, Speedway, Speedflex, Zurn or by fixture manufacturer connected with flexible chrome plated tubing.
- E. Water Pressure Reducing Valves: Watts, Febco or as noted or accepted by Owner.

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2.2 FIXTURES

- A. Refer to Plumbing Fixture Schedule in Drawings for Basis of Design Fixtures.

2.3 CLEANOUTS

- A. Provide cleanouts where required by Code as follows:
 - 1. In floors, Smith 4023, nikalloy finish.
 - 2. In walls of finished spaces, Smith 4472, chrome finish.

2.4 DOMESTIC WATER PRESSURE REDUCING VALVES

- A. Bronze body with renewable stainless-steel seat, replaceable disc, spring in sealed cage with large diaphragm area to accurately control downstream pressure with varying flow rates and upstream pressure. Provide optional bypass and "Y" strainer with perforated stainless-steel screen ahead of each valve.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install fixtures in accord with manufacturers instructions.
- B. Clean and flush traps. Thoroughly clean fixture surfaces with a non-abrasive cleanser.

3.2 SANITIZE PLUMBING PIPING

- A. Thoroughly sterilize entire domestic water system with solution containing not less than 200 parts per million of available chlorine. Introduce chlorinating materials into system in an approved manner. Allow sterilization solution to remain in system for period of 3 hours, during which time open and close valves and faucets several times. After sterilization, flush solution from system with clean water until the residual chlorine content is not greater than 0.2 parts per million.

END OF SECTION 224000

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SECTION 230000 - GENERAL HEATING, VENTILATION AND AIR CONDITIONING PROVISIONS
(Performance Specification)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Components and requirements for Design/Build Heating, Ventilation and Air Conditioning systems.

B. Related Requirements:

1. Division 26 "Electrical" for electrical power connections required for HVAC equipment.

1.2 DESCRIPTION

- A. A completed operating installation of all HVAC systems specified and required shall be provided. All installations shall be in strict compliance with the specifications, drawings, general conditions and contract terms, all applicable current State and Local Codes and Ordinances. In case of conflicts, the quality deemed best by the Owner's Representative will govern.

- B. This Work is Design/Build and documents are to be stamped by an Engineer licensed in the State of Washington.

1.3 SCOPE OF WORK

A. HVAC:

1. Contractor to coordinate, design, fabricate and install the complete Heating, Ventilating and Air Conditioning Distribution System per governing authorities requirements, as specified and as approved by the Owners Representative.
2. Contractor to provide detailed shop drawings; submitted to and approved by governing jurisdiction.
3. Contractor to comply with all State Energy Code requirements and complete State Energy Code forms.
4. Refer to Architectural Drawings for some required equipment, fixtures, etc.

1.4 REFERENCES

- A. ASME - American Society of Mechanical Engineers.
- B. ANSI - American National Standards Institute.
- C. ASTM - American Society for Testing and Materials.
- D. UL - Underwriters' Laboratories, Inc.

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- E. IBC - 2018 International Building Code.
- F. IMC - International Mechanical Code. Including Oregon Mechanical Specialty Code.
- G. NFPA - National Fire Protection Association.
- H. NEMA - National Electrical Manufacturer's Association.
- I. ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers.
- J. UFC - Uniform Fire Code.
- K. SMACNA - Sheet Metal and Air Conditioning Contractors.
- L. NBS - National Bureau of Standards.
- M. AGA - American Gas Association.

1.5 SUBMITTALS

- A. Submit 3 sets of shop drawings, energy calculations and other required information to local jurisdiction for approval, as required.
- B. Submit electronic HVAC shop drawings and product data grouped to include complete submittals of Project products, and accessories in a single submittal to Architect after jurisdiction approval. Each product data is to be labeled and cross referenced to the Drawings. Each shop drawing and product data shall be indexed as follows:
 - 1. HVAC
 - a. Equipment.
 - b. Controls.
 - c. Detailed Drawings and equipment schedules.
 - d. Copy of energy calculations.
- C. Proposed HVAC Products List: Include products to indicate the following:
 - 1. Manufacturer's name and address.
 - 2. Catalog designation or model number.
 - 3. Equipment Schedule Number corresponding to the Drawings mark numbers.
 - 4. Rough-in data and dimensions.
 - 5. Performance curves and rated capacities.
 - 6. Motor characteristics and wiring diagrams.
 - 7. Operation characteristics.
 - 8. Airborne noise levels.
- D. Proposed Drawings: Include Drawings to indicate the following:
 - 1. Detailed HVAC layout to include detailed sheet metal transitions and fittings, inlets and outlets, material sizes and type, hangers and supports, thermostat locations, components and accessories.
 - 2. Detailed HVAC layout will be coordinated with all building features such as Electrical, Plumbing, Structural, etc. Provide drawing sections to clarify equipment/material locations.

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3. Details of seismic restraints and seismic calculations as required to meet code.

1.6 REGULATORY REQUIREMENTS

- A. The Contractor is required to comply with all applicable National, State and Local Codes, Standards, and Ordinances in performing this work. Contractor shall pay for all permits and tests.
- B. All work and materials shall be governed by the recommended practices of; AGA, ANSI, ASHRAE, ASME, ASTM, American Welding Society, American Water Works Association (AWWA), Hydraulic Institute, NBS, NEC, NEMA, NFPA, SMACNA, UBC, UL, UMC, UFC, and latest adopted editions.

1.7 RECORD DRAWINGS

- A. The following work shall apply:
 1. As Installed Drawings: Maintain a set of black line prints of the building plans for the duration of the contract and mark a Record of the Work as installation progresses. Dimensions shall be referenced from Visible Building structural features such as bearing walls or columns.
 2. Include 1 set of record drawings with documents required by Completion Requirements.

1.8 QUALITY ASSURANCE

- A. HVAC
 1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the systems, assemblies or products that are similar in material, design and extent to those indicated for this Project.
 2. Design and installation to conform to IMC, IBC, ASHRAE, SMACNA, local authorities having jurisdiction, and as directed by the Owners Representative.
 3. Specialist Firm: Company regularly engaged and specializing in Commercial Heating, Ventilating, and Air Conditioning systems.
 4. Provide all calculations. (Obtain lighting, equipment loads, etc., from Owner's Representative or Division 26 Contractor.) Load calculations to be clearly marked and include at minimum the following information and calculated data:
 - a. Input (per zone)
 - 1) Materials and associated R and U factors.
 - 2) People loads; number of people and associated btu/hr per person (cooling).
 - 3) Lighting loads; total watts or watt/sq.ft. (cooling).
 - 4) Equipment loads; description of equipment and associated watts/hr or btu/hr (cooling).
 - 5) Minimum outside air for ventilation - per code and ASHRAE standards.
 - b. Output (per zone)
 - 1) Square feet.

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2) Heating, btu/hr.

5. Provide complete energy code compliance forms.

1.9 WARRANTY

- A. All equipment, apparatus and work shall be free from all defects, shall be fabricated, built and installed to deliver its full rated capacity and efficiency for which it was specifically designed.
- B. Without additional charge, replace any work or new material which develops defects, except from abuse, within one year from Owner's Representative acceptance.

1.10 SAFETY

- A. The contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance at the Work.
- B. This requirement will apply continuously and not be limited to normal working hours.

1.11 OPERATION AND MAINTENANCE MANUALS

- A. At least three copies of the Operation and Maintenance (O&M) Manuals shall be submitted and shall contain all manufacturer's data and a complete list of repair and replacement parts necessary for the maintenance of equipment. All recommended oiling methods, filter changes, gasket replacement, preventative maintenance indicating frequency of performance, etc., shall be identified in a cover letter and bound in the front of the O&M manuals. In addition, a written step-by-step detail of the start-up and shut-down procedure shall be incorporated in the letter.
- B. A table of contents shall be included indicating page numbers for major items. In each chapter include operating instructions for each piece of equipment. Include all shop drawings, control drawings, and record drawings.
- C. The Maintenance Manual shall be submitted for approval to the Owner's Representative 10 days prior to Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The contract shall be based upon furnishing all materials and equipment as new, of the best grade, and the latest products as listed in printed catalog data.
- B. All articles of a kind shall be standard product of a single manufacturer.

2.2 AIR OUTLETS AND INLETS

- A. Grilles, Registers and Diffusers
 - 1. All grilles registers and diffusers shall be security grade.

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2. Finish as selected by Owners Representative.
3. Manufacturers: Carnes, Metalaire, Price, Titus or as noted.

2.3 TESTING, ADJUSTING AND BALANCING

- A. At the completion of the job, perform the testing and balancing of the air distribution and heating by an approved independent test and balance agency who specializes in this work.
- B. Submit three bound copies of complete balancing reports on forms which have been reviewed and approved by the Owner's Representative. Provide with the report marked balancing drawings showing air opening numbers and flow station numbers that correspond to the numbering system in the balancing report (logs). Include approved drawings and report with completion requirements.
- C. Test, adjust and balance the air distribution system to within minus 5 percent plus 10 percent of values indicated.

PART 3 - EXECUTION

3.1 GENERAL

- A. Contractor to visit site prior to submitting bid. During visit contractor shall determine existing systems and exact conditions.

3.2 HVAC

A. Design Parameters

1. Design Temperatures (Occupied Areas)

<u>Description</u>	<u>Inside</u>	<u>Outside</u>
Winter	70 Deg F	Per ASHRAE, 99.6%
Summer	75 Deg F	Per ASHRAE, 1%

2. Design Temperatures (Equipment Rooms)

<u>Description</u>	<u>Inside</u>	<u>Outside</u>
Winter	68 Deg F	Per ASHRAE, 99.6%
Summer	68 Deg F	Per ASHRAE, 1%

3. Select grilles registers and diffusers based upon throw, drop and noise criteria. Design not to exceed the following Noise Criteria:

- a. Office and Staff Break Room: 35.

4. Size exhaust systems according to the following minimum criteria:

- a. Toilet Rooms: 12 air changes per hour.

B. Installation

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1. Provide clearance for access to filters, coils, dampers and equipment requiring routine servicing.
2. During construction provide temporary closures of metal or taped polyethylene on open duct work to prevent construction dust from entering ductwork system.
3. Check location of outlets and make necessary adjustments in position to conform to Architectural features, symmetry, and lighting arrangement.
4. Install diffusers to duct work with air tight connection.

3.3 TESTS

- A. The Contractor shall be responsible for scheduling, obtaining permits, making payments of all fees and/or services to test the HVAC systems as specified and as required by local authorities, including balancing of HVAC system.
 1. Any deficiencies, which appear during testing, shall be corrected before progressing further. No equipment or other portions of the HVAC installation shall be covered or concealed until all required tests are satisfactorily completed.
 2. Upon completion, a written certification shall be furnished to attest that the tests have been duly performed. Include a copy with the required operation and maintenance manuals.
- B. An operating test can be requested by the Architect and Owner's Representative at any time to demonstrate satisfactory functioning of any portion or the entire mechanical installation.
- C. A final test shall be made by the Contractor at the completion of the project and after the mechanical system has been in operation for a period of time. Before final acceptance, all defects which appear shall be corrected.

3.4 IDENTIFICATION

- A. General: Permanently label equipment components of each HVAC system to correspond to the contractors drawings. Use plastic laminate with adhesive. Utilize standard markers for identification.

3.5 FINAL ADJUSTMENT AND CLEANING

- A. All equipment shall be checked for proper operation and final acceptance. Clean all equipment remove shipping labels.

3.6 AS-BUILT (RECORD) DRAWINGS

- A. Submit as-built (record) drawings (in Autocad 2000 format) to the Owner's Representative 10 days prior to final completion. The value of these as-built drawings (determined by the Owner's Representative) will be withheld from the Contractor until they are submitted in approved form.

3.7 COMPLETION REQUIREMENTS

- A. Upon completion of the work and adjustment of all equipment, all systems shall be tested by the Contractor to demonstrate to the Owner's Representative that all equipment furnished and installed or connected under the provisions of these specifications functions mechanically in the

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manner required. At the time of this demonstration, the Contractor shall deliver to the Owner's Representative bound copies of the approved operation and maintenance manuals and record drawings.

END OF SECTION 230000

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SECTION 231000 – FACILITY FUEL SYSTEMS (Performance Specification)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes an integrated power fuel oil system. The fuel oil system composed of pump sets, day tanks, filtration systems are connected to a common control system and shall be provided by one manufacturer. The Specification requires the detailed system design, equipment, installation inspection, startup, and training to be the responsibility of a single specialized fuel system supplier. This Specification section includes responsibility for mechanical, electrical, and control systems.
- B. This Work is Design/Build and documents are to be stamped by an engineer licensed in the State of Washington.

1.3 PERFORMANCE REQUIREMENTS

- A. The system shall be in accordance with design standards and shall be designed and built to *N+1* redundancy against failure.
- B. The system shall include:
 - 1. Main fuel oil storage tank(s) and accessories.
 - 2. Fuel oil distribution piping, valves, and fittings.
 - 3. Main fuel oil tank level and leak monitoring system.
 - 4. Main fuel oil tank fill port and spill containment.
 - 5. Fuel oil day tanks.
 - 6. Fuel oil transfer and control – duplex pump sets (as required).
 - 7. Fuel oil day tank selector valves and back pressure valves.
 - 8. Fuel oil filtration system.
 - 9. Fuel oil heating system.
- C. All work shall be installed in accordance with all local and State codes.
- D. All controls shall be provided by one manufacturer and shall be tested at the factory as a single system.

1.4 REFERENCES

- A. API 650 – Welded Steel Tanks for Oil Storage.
- B. API 2000 – Venting atmospheric and Low-Pressure Storage Tanks.

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- C. NFPA 30 – Flammable and Combustible Liquids Code.
- D. NFPA 70 – National Electric Code.
- E. UL 142 – Steel Aboveground Tanks for Flammable and Combustible Liquids.
- F. UL 508A – Standard for Industrial Panels of 600 V or less.
- G. UL 2085 – Protected Aboveground Tanks for Flammable and Combustible Liquids.
- H. Uniform Fire Code – Article 52, Article 79, and Appendix II-F.
- I. BOCA Fire Prevention Code.

1.5 SUBMITTALS

- A. See Section 013300 “Submittal Procedures” and General Conditions for additional requirements.
- B. Mechanical System Design: Indicate system layout, pipe sizes, and location of supports, elevations, and equipment mounting details. For fuel tanks, indicate dimensions, vent sizes and location of all accessories including pumps, fill pipe, man ways, tank supports, tank gauge, and leak sensors. Provide a piping and instrument diagram for the system including a complete bill of material/ equipment list.
- C. Control System Design: Provide control system designs including job specific Electrical Drawings and panel physical equipment layout.
- D. Structural Design: Provide drawings of reinforced concrete tank foundation slabs. Provide drawings of structural steel for ladders and pipe trestles where required.
- E. Calculations: Provide calculations for pump selection, pipe sizes, and pipe support requirements. Provide calculations for size and thickness of tank hold down slab and straps.
- F. Equipment Data: Provide manufacturers information for all equipment.
- G. Permit Applications: Provide copies of all permit applications.
- H. Schedule: Provide a design and installation schedule.
- I. Commissioning: Provide a detailed commissioning plan.
- J. Project Record Documents: Record and submit actual location of piping system, storage tanks, wiring, conduit runs and system components.

1.6 QUALITY ASSURANCE

- A. Comply with NFPA 30, “Flammable and Combustible Liquids Code” for design and construction, installation, inspection, and testing of fuel system components and accessories.

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- B. Comply with NFPA 31, "Installation of Oil Burning Equipment" for design and construction, installation, inspection, and testing of fuel system components and accessories.
- C. Comply with NFPA 70 "National Electric Code" for equipment, wiring, and conduit installed under this Section.
- D. Comply with UL 508A for Industrial Electrical Panels.
- E. Provide equipment and accessories that are listed and labeled.
- F. Conform to ASME Code and applicable State labor regulations for welding materials and procedures.

1.7 QUALIFICATIONS

- A. The fabricator / installer of the system shall provide evidence of prior installations of 10 fuel oil systems of similar capability in the last 5 years.

1.8 REGULATORY REQUIREMENTS

- A. Comply with requirements of the EPA and other state and local authorities having jurisdiction. Include permitting and registering of fuel storage tank.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
- B. Protect all equipment and tanks from damage after arrival on site.

1.10 OPERATION AND MAINTENANCE MANUALS

- A. Operation Data: Include installation instructions and assembly views.
- B. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone number.

PART 2 - PRODUCTS

2.1 TANK GAUGING AND LEAK MONITORING

- A. 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. Critical Fuel Systems.
 - 2. Franklin Fueling.
 - 3. Pneumercator.
 - 4. Architect accepted equal.

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- B. General: Provide a storage tank monitoring system capable of sensing leaks in the tank and the associated piping.
- C. Design Criteria:
1. Tank Level Transmitter: The system shall include a probe capable of detecting the fuel level in the tank. Provide a float type level sensor to provide accurate level monitoring that is unaffected by changes in the specific gravity of the tank liquid and is suitable for use with fuels up to and including No. 6 fuel oil. The level sensor shall consist of a head, connected to a float assembly by a stainless-steel rod or flexible cable. The sensor head assembly shall mount to the tank through a standard 4" 125/150 lb. opening and must be capable of operating in a submerged manhole environment without damage. The unit shall be capable of easy installation and maintenance. The sensor's operation shall be unaffected by internal tank obstructions located outside of a 14" diameter cylinder extending from the top of the tank to the bottom and centered on sensor's mount. A second float is used to measure the accumulation of water at the bottom of the tank.
 2. Monitoring Panel: Provide a microprocessor-based tank gauging, leak detection, and overfill prevention system per NFPA 30 Flammable and Combustible Liquids Code, NFPA 31 Standard for the Installation of Oil-Burning Equipment and NFPA 110 Standard for Emergency and Standby Power Systems. The indicator, printer, level sensors, leak sensors, and overfill alarm station shall be supplied by one manufacturer. The indicator and sensors shall be intrinsically safe for Class 1, Division 1, Groups C and D hazardous locations as defined by the National Electric Code. The monitoring panel shall display the tank volume in gallons. The panel shall indicate alarm conditions for fuel high level, fuel low level, tank leak and containment pipe leak. The tank gauges shall be able to monitor all tanks as shown on the Drawings. All tank levels or leak sensors signals shall be provided as 4-20 mA or contact closure for easy interfacing to other devices as shown on the drawings. Continuous sensor wiring fault detection (open or shorted) shall be provided. Automatic delivery detection logic shall trigger a printed, and data logged, report displaying the time, date, and amount delivered for delivery verification. Provide idle tank theft alarming capability for standby tanks or emergency generator tanks as required.
 3. The system shall be fully field configurable. The system shall be able to automatically generate a stick chart based on measured delivery flow and measured level if an accurate stick chart is not available for the tank.
 4. The printer shall automatically or manually print:
 - a. Current inventory.
 - b. Time/Date.
 - c. Last 10 time/date stamped alarms.
 5. Quality Assurance: The tank monitoring system shall be manufactured and labeled in accordance with UL508 requirements and shall be labeled as Intrinsically Safe for Tank Monitoring applications.
 6. Leak Detection:
 - a. Provide and install leak detection as specified.
 - b. Provide and install an overfill alarm station for each tank that will alarm when signaled from one of the above tank gauges when an overfill condition has been reached. The overfill alarm panel shall contain a 4" weatherproof alarm horn with automatic silencing, 180 degree flashing lamp, bell silencing pushbutton, and alarm test pushbutton. Optional digital display of gallons can be added. Alarm can be instantly silenced with the silencing pushbutton or in 90 seconds automatically if silencing pushbutton is not activated.

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- c. Provide and install an Overfill Caution Sign near the Overfill Alarm Station. The Caution Sign shall read: "CAUTION WHEN ALARM BELL SOUNDS OIL TANK FILLED TO CAPACITY DO NOT OVERFILL".

2.2 FUEL OIL PUMP SET

- A. 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. Critical Fuel Systems.
 - 2. IMO Pump.
 - 3. Viking Pump.
 - 4. Architect accepted equal.
- B. Description: System to be factory fabricated/tested and certified as a complete unit. Field assembled units are not acceptable. The pump set for generator applications must be provided by the same manufacturer as the day tank controls and sensors provided to assure that all the controls work together.
- C. The system shall be provided with a duplex fuel oil transfer pump set rated for full flow at the required pressure. Duplex pump set requirements:
 - 1. Sized to provide full specified flow capacity from each pump. To ensure compliance with NFPA70e the pump set shall be provided with two separate electrical panels, 1) Electrical Motor Controller Module, and 2) 24vdc Logic Control Module installed as part of a skid package or as a wall mount cabinet associated with either a skid or enclosure type package. The pump set shall be preassembled and tested by the manufacturer at their facility; job site assembly will not be permitted. All piping shall be schedule 40, or heavier, black pipe suitable for use with fuel oil. Pipe fittings shall be malleable or steel fittings rated for 150 psi and suitable for use with fuel oil. The use of galvanized pipe or fittings is forbidden in the construction of these systems. Threaded connections are satisfactory except, where noted on the Drawings. On welded systems, where threaded connections are necessary by design of individual components, a threaded nipple and welded flange shall be used. The pump set shall be finished with industrial enamel, suitable for this application. All electrical conduits will be liquid tight or better.
- D. Major System Components:
 - 1. Pumps:
 - a. Positive displacement pumps with cast iron housings shall be provided, bronze or brass housed pumps are not allowed. The pump shall be coupled to a TEFC (or TEPE Premium Efficiency on 1PH and above) motor with a flexible coupling. The flexible coupling shall be provided with a full OSHA approved coupling guard. The motor and pump assembly shall be permanently aligned with a precision permanent alignment bracket to the OEMs published standards. Pumps and motors shall be mounted with bolts threaded into the steel channel for ease of maintenance, mounting bolts shall not penetrate the secondary containment basin. The pumps shall be provided with self-adjusting mechanical seals, packing type shaft seals are not allowed. Pumps that have aluminum, brass or bronze housing or rotors are not acceptable.
 - 2. Pump Isolation and Check Valves:

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- a. Provide and mount four (4) pump isolation valves. Locate one (1) valve on the suction and discharge side of each pump. Isolation valves will allow off-line pump maintenance without system loss of availability. Isolation valves shall be ball type, rated 600WOG, include stainless steel ball and Teflon seat. Valves to provide full flow while open and positive shutoff when closed. Additionally, two (2) class 125# spring check valves shall be provided and mounted, one (1) located on the discharge of each pump.
3. Relief Valves:
 - a. Provide for each pump a relief valve sized to relieve the full outlet flow of the pump at rated pressure without causing the pump motor to overload or any of the pump set component's pressure rating to be exceeded if the discharge is inadvertently closed off or restricted. Relief valves are to be mounted remotely from the pumps and piped to the return lines as shown on the Drawings. Pump internal relief valves are not accepted except if shown on the Drawings.
 4. Compound and Pressure Gauges:
 - a. Provide and mount a compound gauge on the common suction header feeding the pumps. The gauge shall read 30" vacuum and 30 psi pressure (30" Hg-0-30psi). Provide and mount a pressure gauge on the discharge side of each pump with the normal pump pressure shown at mid-scale. All gauges shall be provided with an isolation ball valve with 4 or 2½ inch dials.
 5. Strainers:
 - a. A Model STR-D cast iron duplex strainer with a 1/16 perforated basket shall be provided. The strainer shall be rated for oil service at a minimum 150psi working pressure. This strainer shall be of the dual ball diverter design; single plug type diverters are unacceptable. The diverter configuration shall be stainless steel balls operating on a common shaft in Teflon seats. The operating handle shall clearly indicate which basket is in service. No special tools shall be required for operation or maintenance. The strainer shall be selected by the pump set manufacture to meet the capacity of the pump set with a maximum, clean basket, pressure drop of 1" Hg.
 - 1) Strainer shall be equipped with a factory mounted and wired differential pressure switch to indicate that the basket needs to be checked and cleaned. Indicating scale plate shall be three-position color-coded for easy indication of strainer basket status.
 6. Pump Base:
 - a. The pump base shall be designed and constructed to act as a containment basin with a minimum 3" continuously welded reservoir wall providing containment. Electrical motors and components shall be mounted above maximum liquid level of containment basin. To minimize trip hazards and equipment damage all pump set components shall be located within the perimeter of the containment basin walls, no extrusions are allowed. The pump set base shall use no less than 3/8" plate, using less than this thickness will be grounds for rejection. Provide 1/2" plugged containment basin drainage connection.
 7. Leak Switch:

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- a. A Model PLS float switch shall be provided to detect a flooded containment basin. The switch shall be normally closed, opening on a rise in liquid level of the containment basin. The float switch shall be compatible with fuel oil and be located within the perimeter of the containment basin.
8. Pump Automatic Sequencing Flow Switch:
- a. Provide a time delayed flow sensing switch (Model FS) on the discharge of the pump set to bring on the lag pump should the lead pump fail to maintain flow. Flow switch shall be vane operated to actuate a single double throw snap switch. Switch shall be rated for 1450 psig. Provide a flow switch outlet isolation valve for maintaining the flow switch without draining the fuel system.
- E. Motor Controller Module: A fully functioning, UL 508 listed motor control panel shall be provided and permanently mounted on fuel oil pump skid. This panel shall contain the following components:
1. NEMA 4 rated metal enclosure.
 2. Service, disconnect for each fuel pump motor.
 3. Hand-Off-Auto pump selector switch for each fuel oil pump.
 4. Pump status and alarm lamps.
 5. Terminal block for all skid and field wiring connections.
 6. Control power transformers as required.
 7. Pump running hour totalizers.
 8. Alarm bell.
- F. The motor control module shall provide field wiring terminal and pilot devices for remote operation of the fuel pump set and monitoring of system safeties and components.
1. Provide for local-manual operation of individual fuel pump or select auto for operation by control system.
 2. Alarm upon input from logic control system.
 3. Provide flooded basin and strainer D/P alarm discreet signals to control system, alarm shall be energized upon switch opening.
 4. Provide individual positive pump flow discrete signal to control system.
- G. Major Functions:
1. Logic Control Module: A fully functioning, 24 VDC, UL 508 listed motor control panel shall be provided and permanently mounted on fuel oil pump skid and integrated with the Motor Control Module.
 2. NEMA 4 rated metal enclosure.
 3. Preprogrammed and configured nonproprietary PLC hardware.
 4. The Logic Control Module shall provide all logic to operate the pump set, monitor and control levels for the day tanks, and start, stop, and rotate fuel pumps.
 5. Monitor day tank level switches.
 6. Monitor day tank temperature switch.
 7. Monitor day tank leak detector.
 8. Monitor day tank flooded vent switch.
 9. Control and monitor up to 3 tank fill manifolds.
 10. Provide alarm output to fill manifold junction box or local control box.
 11. Monitor tank gauging system alarm output.
- H. Safety and environmental provisions:

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1. Storage tank leak detection shall detect leakage at a rate of 0.1gph.
 2. Containment basin with 4" reservoir walls to prevent the release of fuel oil through minor drips, seal failure and strainer leakage.
 3. Fail safe operation of flow switches and safety devices.
 4. Leak detector switch for containment basin.
 5. OSHA approved coupling guard and alignment bracket.
 6. NFPA 70e compliant low voltage logic control panel.
- I. Communication Interface to Building Automation Systems:
1. Modbus, BACnet or other IP Interface shall be provided as shown on Drawings.
 2. The interface shall provide monitoring on the following points:
 - a. Pump Run Status.
 - b. Flow Switch Status (if supplied).
 - c. Leak Switch Status (if supplied).
 - d. High Strainer DP Status (if supplied).
 - e. General Alarm.
 3. If no interface is used the system shall provide discrete contact outputs for the following:
 - a. Pump 1 Run.
 - b. Pump 2 Run.
 - c. Leak Switch Status.
 - d. Strainer DP Status.
- J. Environmental Conditions may be dirty, dusty, and damp. All equipment shall be suitable for use in this environment.
1. The pump motor shall be TEFC/TEPE.
 2. The motor control module enclosure shall be NEMA 4 rated with NEMA 4 pilot devices.
 3. All wiring shall be enclosed in liquid tight conduit in accordance with NEC standards.
- K. Quality Control and Factory Testing:
1. The fuel pump set shall be tested for tightness and proper operation prior to leaving factory. The pressure test for tightness shall be a "wet" test with fluorescent liquid; the system shall be brought to pressure and after 60 minutes, each joint shall be visually inspected under pressure with a fluorescent lamp. If any leaks are detected repairs must be made and the system shall be retested in its entirety. Simply testing the system with air pressure and soap bubbles is unacceptable.
 2. After a successful pressure and documentation of those results, each pump shall be energized, checked for proper rotation and operation. The motor full load amps shall be read and recorded. The manufacturer shall set all pressure relief and regulating valves, the settings shall be recorded on tags affixed to each individual device and noted in the installation/operation manual shipped provided to installing contractor.
 3. The testing liquid shall be purged. If fuel oil is used as the test media it must be removed sufficiently to prevent any accumulation that could result in spillage during transportation, unloading or installation.
 4. The Owner or the Owner's Representative may witness the testing. This factory acceptance test requirement is to be noted in the submittal approval. It is the responsibility of the owner or his representative to coordinate his schedule with the manufacturer so as not to affect manufacturing or delivery schedules.
 5. Wiring: The wiring between the Logic Control Module, the Motor Control Module and individual pump set components shall be installed by the manufacturer, at his facility, to

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provide a single location for connection of field wiring. The wiring shall be done in accordance with NEC with special attention being paid to ensure conduits are not overfilled. If the Logic Control Module is to be mounted separately from the pump set, this will require field wiring by a qualified electrician.

2.3 DAY TANK AND RETURN PUMPS

- A. Available Manufacturers for Day Tank: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Critical Fuel Systems.
 2. Highland Tank.
 3. Lannon Tank.
 4. Architect accepted equal.
- B. Provide a UL 142 listed fuel oil day tank. Day tank shall be for use with a main tank to provide an automatic, self-refilling fuel supply system.
- C. When duplex or remote transfer pump set is used, the day tank shall be equipped at least with an inlet solenoid valve arrangement (flow control manifold).
- D. Design Criteria:
1. Day Tank Capacity: Provide the number of tanks and sizes as indicated on the Drawings.
 2. Return Transfer Pump: As indicated on the Drawings, but always the same or greater flow than the supply pump(s) or supply system.
 3. Day Tank Construction:
 - a. All welded steel atmospheric tank of rectangular construction built in accordance with codes and standards noted above for indoor use with fuel oil.
 - b. Pipe thread connections provided for fuel oil supply from main tank, supply to prime mover, return from prime mover, and overflow to main tank, vents and drain. Manufacturer shall factory-install a direct reading tank gauge. Provide a multi-level switch probe (rated at 50VA) for day tank level control. Switch device shall be constructed of an integral brass probe with Stainless Steel level switches, and a weatherproof and explosion-proof head. Standard levels shall be:
 - 1) Low-low level, (15% tank capacity) to be used to shut down the generator command,
 - 2) Low-level, (40% tank capacity) for alarming and to turn on both supply pumps,
 - 3) Lead pump on - fill (50% tank capacity),
 - 4) Lead pump off - full (80% tank capacity),
 - 5) High level alarm and pump shut down (90% tank capacity),
 - 6) As noted in the design drawings a 95% level switch can be used to turn on the return pump to keep the tank from overflowing if no gravity overflow line is available.
 - c. Provide an additional switch for overflow alarm to be mounted in the vent. Vent switch shall be mounted as close to the top of the tank as possible, no more than one foot.

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- d. Vent minimum size shall meet UL requirements as determined by the size of the day tank.
 - e. An inspection port in the top shall be provided, which is easily accessible without removing other equipment on the day tank.
 - f. The tank shall be equipped with a welded steel channel base suitable for bolt attachment to a concrete pad.
 - g. Exterior shall be painted in a Chemical-Resistant Finish over a rust-resistant primer. The interior shall not be painted.
 - h. The tank shall be rated for 5 PSIG. Safety and environmental safety provisions shall be provided to prevent the escape of fuel oil into the environment. This shall include a sealed and pressure tested double wall or single wall with rupture basin day tank built, tested, and certified to UL 142 standards.
 - i. Factory Testing: Fuel oil storage tank and day tank pneumatic testing is required to ensure tightness prior to shipment. The minimum pressure for testing the tank shall be three (3) psi. The pneumatic pressure shall be maintained until all joints and connections have been visually inspected for leaks, but in no case for less than one-half hour. The tank shall not show any permanent deformation because of the test. The Rupture basin (open top) shall be hydrostatic tested prior to shipment. The basin shall maintain a full water level while all joints and connections are visually inspected for leaks. The test shall be run for no less than one-half hour. A copy of the test procedures shall be sent to the consulting engineer and owner. The Owners, at their discretion, shall observe this and all other tests.
4. Accessory Equipment:
- a. Return Fuel Pump: Day tank shall be equipped with a factory installed return fuel oil pump. Return pump shall be fitted with a dip tube that will reach to within six inches from the bottom of the day tank to insure prime. Return pump shall have an external relief, be made of the same materials, and be rated by the same standards as the supply pumps.
 - b. The day tank shall be further fitted with an emergency overflow pipe port that must be attached to the "FOR" return line. The installing contractor is to pipe the return line so that when the return pump is running, it cannot discharge fuel back into the day tank. The emergency overflow port shall not be fitted with a dip tube. If, however, at any time the return piping rises above the day tank before returning to the main tank and, also in the circumstance where the main tank is higher in elevation than the day tank, contractor is to cap off the emergency overflow port and omit its use.
 - c. Fitted onto the pump return (discharge of pump) piping, a flow switch. The flow switch will signal if the return pump is flowing oil. The Return Pump will operate when day tank high tank level has been reached (90 or 95% tank level) and/or when the day tank fuel temperature RTD has indicated the fuel oil temperature in the tank is too high. Day tank shall have a factory installed Oil Temperature RTD to provide the day tank fuel oil temperature information to the control panel. This assembly shall have a 0.10% accuracy, Waterproof head, spring loaded element, with 304 Stainless Steel reduced tip, have an adjustable dead band, and always reach down to 2" off the bottom of the day tank. As set, the RTD will provide the signal for the oil return pump to activate and return the heated day tank oil back to the main tank at the temperature setting. This pump operation is to assure that the day tank oil does not overheat. The Return pump will lower the day tank oil level to the 50% tank level and shut off, whereupon the lead supply pump will start (or, for multiple tanks) solenoid manifold shall open whereupon cool oil from the main tank will refill the tank to the 80% level. If the RTD still indicates the fuel is too hot, the pumping sequence will repeat until RTD temp declines below RTD temp. set point.

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- d. The return pump shall be sized to provide approximately at least 100% of the total fuel supply capacity.
 - e. The return pump shall be activated and controlled by the control cabinet. This cabinet will include a HOA switch to allow both automatic operator as well as manual operation.
 - f. For multiple main tank installations and where one or more fuel pump sets are used, provide for the use of multiple automatic ball valves for both supply (FOS) and return lines (FOR) to select which main tank to draw oil from and return to. Automatic Oil flow strategy is to draw from and return oil to the same main storage tank, one at a time. Main Fuel Oil Control panel will be required to control this function and offer a clear sequence of operations when this strategy is used.
- E. Each day tank shall be equipped with top mounted ports. The only drain shall be for the containment. No drain shall be provided for the tank itself to keep from an accidental spillage. The drain port shall be provided near the floor with a hand valve and plug. All tank ports are to be clearly labeled as to their function.
- F. Major system components (sizes as show on Drawings or as required by UL142):
- 1. Tank fill-tank connection with drop tube.
 - 2. Tank overflow/return connection.
 - 3. Tank normal vent and interstitial normal vent connection.
 - 4. Tank normal emergency vent and interstitial emergency vent connection.
 - 5. Equipment supply connection with drop tube with foot valve.
 - 6. Equipment return connection with drop tube.
 - 7. Double wall interstitial or rupture drain connection.
 - 8. Level control switch port(s).
 - 9. Temperature monitoring port.
 - 10. Inspection port.
 - 11. Interstitial or rupture basin port.
- G. Day Tank Accessories:
- 1. Fill Manifold shall be sized to replace the fuel consumed and not returned, back to the day tank by the generator, at full load, by a ratio of no less than 4-1. The fill manifold shall be pre-piped and prewired to a local control module. The piping shall be schedule 40 or heavier and consist of the following components:
 - a. Two (2) automatic fill valves piped in sequence to provide 2 valve protection, greatly reducing the chance of flooding the day tank due to valve leak by. These valves shall be normally closed, opening upon a call for fuel.
 - b. Three (3) valve bypass arrangement, consisting of full flow ball valves rated for fuel service at the design pressure of this system and a single globe valve to be used as a manual flow control. This shall be arranged in a way that provides full isolation of the filters, strainers, flow switch, and automatic valves while allowing manual control of the day tank fill.
 - c. Flow switch shall be installed to verify that flow is established when the control system opens the fill valves. If flow is not established the control system should sound alarm and illuminate alarm lamp on fill manifold junction box.
 - d. Flow limiter shall be sized to replace the fuel consumed by the generator at a ratio of no less than 4-1 and no more than 6-1 to prevent foaming in the day tank or starving the fuel transfer system.
 - e. Basket strainer shall be provided with a 100-mesh removable basket. "Y" type strainers are not allowed.
 - f. Differential pressure switch will be piped across the strainer and fuel filter, monitoring the combined differential pressure.

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- g. Fuel oil filter shall have a replaceable element.
 - h. Fuel oil gauges shall be glycerin filled with a 2.5" dial and be designed for rugged duty, wetted parts shall be bronze or stainless steel and the gauges shall be suitable for system design pressure.
 - i. Visual flow indicator shall be of a maintenance free design and guaranteed to be leak free for a minimum of 3 years. This device shall be a paddle wheel or propeller type indicator visible through glass window on both sides.
 - j. Electrical local control module shall be UL 508 listed and NEMA 4 rated, it shall be provided with a red alarm lamp, blue lamp that indicates that the fill valves are energized, and a hand-auto switch, all pilot devices shall be rated NEMA 4 or better. The alarm lamp will be energized by Total Fuel Management Center upon a flow failure. The hand-auto switch when placed in auto will allow the controller to energize the automatic fill valves. In the hand position the switch shall energize the automatic fill valves, if the fuel level in the day tank reaches the high level switch all power will be cut to the circuit causing the automatic fill valves to close and energize the alarm lamp.
 - k. The electrical conduit and fittings shall be liquid tight to maintain the NEMA 4 integrity of the junction box. The conductors shall be stranded copper suitable for the application.
- 2. High Temperature switch shall be installed in the day tank. The temperature switch shall be set for 130 deg F and shall open upon a temperature rise. This switch shall be monitored by the Fuel Management System; the system shall sound an alarm and/or start the return pump.
 - 3. Flooded Vent Switch: A float operated switch shall be installed no more than 12" from the day tank in the first vertical run of the vent line. This flooded vent switch contact shall be normally closed, opening on an accumulation of liquid in the vent line.
 - 4. Tank vent shall be capped to allow an open path for air to enter and exit the tank during normal operation. The vent cap shall prevent intrusion into the vent line from rain, debris, and insects.
- H. Available Manufacturers for Return Pump: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- 1. Critical Fuel Systems.
 - 2. IMO Pump.
 - 3. Viking Pump.
 - 4. Architect accepted equal.
- I. Provide a simplex return pump that is factory assembled with components piped and mounted on a common base plate. Pipe shall be schedule 40 ASTM A-53 Grade "A" with ANSI B16.3 Class 150 malleable iron threaded fittings. Base pan shall include a minimum 3" steel side rails and be continuously welded out of minimum ¼" plate steel for containment and mounted to the top or off the top of the tank. Provide a ½" containment basin plugged drain connection. The basin shall also be sized to contain potential leaks from all factory-installed piping and components.
- J. Motor: Provide and mount TEFC/TEPE, rigid base, standard NEMA frame motors. Motor shall have copper windings; a dynamically balanced rotor, ball bearings and a heavy gauge steel NEMA frame.
- K. Pump and Motor Assembly: The return pump and motor assemblies shall be welded to the base pan as noted on the drawing. Pumps and motors shall be mounted on an ASTM-A36 structural steel channel and equipped with flexible coupling and full OSHA approved coupling

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guard. Pumps and motors shall be mounted with bolts threaded into the steel channel for ease of maintenance. Mounting bolts shall not penetrate the containment basin.

- L. Flexible Coupling: The return pump shall be connected to the motor by an elastomeric jaw type flexible coupling that does not require lubrication. The coupling wear member shall be replaceable without disturbing the alignment of either the pump or motor. Sizing of the flexible coupling shall be based on motor horsepower and rpm. Materials of construction: The coupling body shall be sintered iron and cast iron. The elastomeric wear member shall be NBS Rubber.
- M. Pump Isolation: Provide and mount a pump isolation valve on the outlet of the return pump after the relief valve. Isolation valves shall be ball type, rated 600 WOG, include stainless steel ball and Teflon seat. Valve to provide full flow while open and positive shutoff when closed. Additionally, one class 125 # spring check valves shall be provided and mounted on the discharge of each pump to prevent back pressure from a common return line.
- N. Fuel Oil Strainer: Factory install one (1) Simplex strainer, basin mounted on the suction side of the pumps. Strainer to be sized for less than ½ psi of mercury drop through a clean strainer basket with the maximum anticipated flow in the suction line. Strainer shall be one-piece cast iron body and shall be suitable for 200 psi. Strainer baskets shall be 40-mesh stainless steel. Strainer shall come complete with lever wrench handle and be bolted in place without bolting through pan.
- O. Relief Valves: Provide and mount an external relief valve sized to relieve the full outlet flow of the return pump without causing the pump motor to overload or any component's pressure rating to be exceeded if the discharge is inadvertently closed off by a closed valve.
- P. Pressure Gauges: Provide and mount a pressure gauge on the discharge side of the return pump. Each gauge shall be equipped with an isolation ball valve.
- Q. Return Pump Basin Leak Detection Switch: Provide a factory mounted and wired float operated Containment Basin Leak Detection Switch to shut off the pumps and energize an audible and visual alarm should a leak be detected. The leak sensor shall be a plasma welded stainless steel construction. The leak sensor shall be internally mounted within the pump basin. Electrical connections shall be contained in a factory installed weatherproof junction box.
- R. Day Tank Control Cabinet: Provide a control cabinet factory mounted on the day tank. System shall be custom designed to accomplish the control strategy as outlined. To allow pump operation in the event of pump set PLC failure, provide hard wired, safety interlocked, Hand-Off-Auto manual switches for the return pump. Control hardware shall include combination magnetic motor starter with overload protection and circuit breaker for the return pump.
- S. Day Tank Relay Based Control System:
 - 1. 24vdc relay-based controller designed to interface with the day tank's level switches, and leak/overflow detector switches to control the level of a single day tank.
 - 2. Major system components:
 - a. NEMA 4 steel enclosure.
 - b. Alarm light and alarm silence button.
 - c. Power on lamp.
 - d. Level alarm lights as shown on the Drawings.
 - e. Alarm horn.
 - 3. Major functions of the fuel oil control system shall be as follows:

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- a. The system shall monitor the level switches and send a “call for oil” signal to the pump set control panel. A hardware interlock from the high-level switch will be used at the pump set control panel to not allow pump operation even in manual (hand).
 - b. Day tank fill manifold control and monitoring.
 - c. Other functions as shown on the Drawings.
4. Interface and communication (discrete I/O):
- a. Call for oil.
 - b. High level interlock.
 - c. Low level alarm.
 - d. Leak detected.
- T. Environmental, Safety and Quality:
- 1. Environmental Conditions: The fuel oil control system shall be constructed to NEMA 4 or NEMA 4X standards.
 - 2. Wiring shall be in accordance with NEC standards, using stranded copper conductors in liquid tight conduit. Special care shall be taken to ensure conduits are not over capacity and in accordance with NEC requirements.
 - 3. Safety and environmental safety provisions:
 - a. The system shall be designed to operate in a “fail Safe” mode. Fail safe is defined as to prevent the overflow of oil into the environment upon a power loss or circuit break.
 - b. For arc flash protection as defined by NFPA 70e. This system shall be designed to operate with 24vdc, no voltage over 49vdc shall be permitted in the panel.
 - 4. Quality Assurance: The Control Cabinet shall be manufactured and labeled in accordance with UL508A (CSA C22.2 #14 for use in Canada). Simply supplying UL recognized individual components are not sufficient. The assembled control cabinet must be inspected for proper wiring methods, fusing, etc., and must be labeled as conforming to UL508A.

2.4 CONTROLS

- A. 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. Allen Bradley Compact Logix.
 - 2. Critical Fuel Systems.
 - 3. Siemens S7.
 - 4. Architect accepted equal.
- B. Simple Relay Based Pump Set Controls:
- 1. Simple relay-based controls are typically found in boiler pump set applications. Operation is to turn on the pump set when the boilers need to run on fuel oil. This is done with a “Hand” operated switch to start the pump. The pump will run if the unit is in “Hand”. The other position is “Off” where the pump is deactivated. In “Auto” the pump will run based on a “call for oil” signal from the boiler(s) or any devices requiring fuel oil.

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2. The controls will monitor the flow switch and if no flow is detected after a set number of seconds the lag pump is started. The lead pump is selected by a switch on the front panel. The lead pump will be deactivated.
 3. The controls will monitor a base pan leak switch for the pump set, if a leak is detected the pump will stop.
 4. All relay logic is based on 120VAC as developed from the power transformer, control panels voltages, are based on the power requirements of the pumps.
- C. Provide a Master Panel control panel; locate as directed by Owner. This master panel will display all the data contained in the fuel oil control system to allow system wide monitoring and control. The Master Panel will make use of a touch screen interface that will show data as shown on the various operating screens throughout the system in one location.
- D. Provide a Remote Screen control panel located in Office as directed by Owner. The remote screen is to provide information that is provided at another location within the control system.
- E. Automatic Pump Prime, Suction Line, and Day Tank Level Switches Integrity Safety Check Test: The control system shall include a battery backed, real time clock and must be capable of automatically energizing the lead pump once every day. This safety check is to verify the automatic piping integrity, pump prime, and to verify pump operation including the day tank level switches operational readiness. Once the lead pump has proven satisfactory operation, the lag pump shall be energized and run through the same test. These tests shall be recorded in the controller memory with a Time/Date stamp for later verification or diagnosis. If either lead or lag pump fails any of these tests, the control system shall generate an audible and visual alarm and log the "Failed Pump" condition. The day tank return pump(s) shall be similarly tested whereby each return pump shall be activated and return oil back to the main tank continuing until the day tank low level switch is activated. The return pump shall stop, and the lead supply pump will restart. The Supply pump will refill the day tank up to the 90% level, activating that switch again. The supply pump will shut off and the return pump restart until the day tank level has dropped to the supply pump-off level. The supply pump will finally restart and fill the tank back to the pump-off (80%) level and then stop. This test sequence will demonstrate that not only the supply and return pumps, but also all level switches in the day tank are functioning properly. If during this sequence, any pump or level switch shall prove faulty, the control system shall generate an audible and visual alarm and log such event as a "failure" condition.
- F. Wiring shall be in accordance with NEC standards, using stranded copper conductors in liquid tight conduit. Special care shall be taken to ensure the conduit is not over capacity in accordance with NEC.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for facility fuel systems to verify actual locations of piping connections before packaged facility fuel systems installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.3 FUEL TANK INSTALLATION

- A. Install tanks in strict accordance with the manufacturer's recommendations, PEI/RP100 and PEI-RP200, and applicable fire and environmental codes. State and local permits shall be obtained prior to installation.
- B. Aboveground tanks shall be clearly marked on all sides with warning signs: "FLAMMABLE" or "COMBUSTIBLE", "NO SMOKING", tank volume, product identification, and other signs as required by the applicable codes.
- C. Electrical work shall be in accordance with applicable codes and shall be rated for hazardous area as required. Tanks shall be electrically grounded in accordance with NFPA 78.
- D. The tank installation shall be inspected and approved by the tank supplier or its certified contractor. The tank supplier shall submit a comprehensive checklist of quality and safety items critical to the system and verify that the installation has been in accordance with these standards and applicable fire and environmental codes.

3.4 ABOVEGROUND PIPING INSTALLATION

- A. Install in accordance with the manufacturer's instructions and PEI/RP200-92.
- B. Inspect all materials for signs of damage and confirm compliance with Specifications.
- C. Avoid damage to piping materials or coatings during handling, installation, and testing.
- D. Provide adequate support for piping on 10-foot centers minimum.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction so that pipe, joints, or connected equipment will not be stressed.
- G. Provide clearance for access to valves and fittings.
- H. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of the completed system.
- I. Install unions, couplings, valves, and flexible connectors in accordance with manufacturers' recommendations.

3.5 TANK LEVEL AND LEAK MONITORING SYSTEM INSTALLATION

- A. Install in strict accordance with the manufacturer's recommendations, National Electrical Code NFPA 70, and NFPA 30A.
- B. Electrical work shall be rated for hazardous area as required.

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- C. Install the monitoring system control panel as indicated on the Drawings.
- D. Install the tank level transmitter and the interstitial leak probe in the proper locations in the fuel tank. Install the piping sump sensor in the piping sump.
- E. Install the overflow alarm as specified and as shown on the Plan.
- F. The leak monitoring system installation shall be inspected and approved by the equipment supplier or its certified contractor. The leak monitoring system supplier shall submit a comprehensive checklist of quality and safety items critical to the system and verify that the installation has been in accordance with these standards and applicable fire and environmental codes.

3.6 FIELD QUALITY CONTROL

- A. Test fuel distribution system according to NFPA 30. Replace leaking joints and connections with new materials.
- B. Test and adjust fuel management and leak monitoring systems controls and devices. Replace damaged and malfunctioning controls and devices.
- C. Submit reports of testing and procedures in writing to the Architect.

3.7 DEMONSTRATION AND TRAINING

- A. Train Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.
- B. Representatives of equipment suppliers for the fuel tanks, fuel pumps, day tanks, and leak monitoring system shall provide necessary training and technical support to the Owner so that the Owner may properly operate and maintain the systems.

3.8 COMMISSIONING

- A. Before activating the system perform these steps:
 - 1. Flush system piping with grade of fuel to be used by owner to remove any debris and foreign matter in piping prior to filling tank for the first time. Service all system filters and screens and dispose of fuel in accordance with EPA and NFPA regulations after flushing.

END OF SECTION 231000

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SECTION 260000 – GENERAL ELECTRICAL PROVISIONS (Performance Specification)

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section is specifically applicable to the Basic Electrical Requirements, in addition to Division 01 – General Requirements.
- B. The General Conditions and General Requirements (Division 01) apply to this Section.
- C. This Section also includes provisions from Sections 260500, 261100, 261200, 261400, 264000, 264500 and 265000.

1.2 DESCRIPTION

- A. A completed operating installation of all electrical systems specified and required shall be provided. All installations shall be in strict compliance with the Specifications, Drawings, General Conditions and Contract Terms, all applicable current State and Local Codes and Ordinances. In case of conflicts, the quality deemed best by the Owners Representative, will govern.
- B. This Work is Design/Build.

1.3 SCOPE OF WORK

- A. The Work is Design/Build and Contractor shall provide lighting, power, fire alarm systems design, low voltage conduit, labor and material construction services associated with the Project. Reference Architectural Drawings for Area of Work.
- B. A State of Washington Licensed Supervising Electrician who complies with State of Washington Requirements shall provide the Electrical design.
- C. Refer to Architectural Drawings for some required equipment, fixtures, etc.
- D. Contractor is to verify requirements and submit and obtain approval from Washington State Bureau of Labor and Industries and Okanogan County, if required. Contractor is responsible for paying all costs for obtaining a permit.

1.4 DRAWINGS

- A. Prepare and submit electronic electrical floor plans to the Architect in 22" x 34" format after gaining approval from Washington State Bureau of Labor and Industries, if applicable. Submit drawings on a disc in electronic format using AutoCAD version 2000. Show all details legibly and neatly. Architect to provide floor plan in electronic format for Contractors use.
- B. Prior to final acceptance of this Work the Contractor shall submit the following to the Architect:
 - 1. Electrical Design Drawings.

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2. Record Drawings.
3. Operating and Maintenance Manuals.
4. Certificates of Code Authority Acceptance.
5. Contractors' Labor and Material Warrantees.
6. Other project documentation specified herein.

1.5 CODES AND PERMITS

- A. This Work shall comply with the latest Rules and Regulations of the State and Local Authorities Having Jurisdiction, National Electrical Code, International Fire and Building Codes.
- B. Obtain and pay for all required permits, plan check charges and certificates. Deliver Certificates of Acceptance from the Code-Enforcing Authorities to the Architect.

1.6 COOPERATION WITH OTHER CRAFTS

- A. Cooperate with other crafts (or contracts) as may be necessary for the proper execution of this Work.

1.7 INSPECTION, OBSERVATION AND TESTS

- A. Provide one (1) journeyman, tools, meters, instruments, and other test equipment required to properly complete the Work. Contractor to remove and replace trims, covers, fixtures, etc., and test materials, systems, methods, and Workmanship in the presence of the Architect for final review at completion of this Work.

1.8 GUARANTEE AND CLEAN-UP

- A. Keep tools and materials in an orderly manner throughout the construction period. Upon completion of this Work remove all excess materials, tools, dirt, and debris from the job site.
- B. Leave the entire electrical system installed under this Work in clean, dust-free, and proper Working order.
- C. Without additional charge, replace any Work or material, which develops defects, except from abuse, within one (1) year from acceptance unless otherwise noted.
- D. Lamp guarantee is from date of Architect occupancy or acceptance, six (6) months for LED lamps.
- E. Labor for lamp installation is to be provided by the Contractor for a thirty (30) day period.

1.9 SPREAD OF FIRE OR PRODUCTS OF COMBUSTION

- A. Electrical installations in hollow spaces, vertical shafts and ventilation or air-handling ducts shall be so made that the possible spread of fire or products of combustion will not be substantially increased.

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PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 260000

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SECTION 260500 – BASIC ELECTRICAL MATERIALS AND METHODS (Performance Specification)

PART 1 – GENERAL

1.1 PRODUCT DELIVERY AND STORAGE

- A. Scratched, marred, or deformed materials will not be accepted.
- B. Fixtures, material or equipment in wet cartons or boxes, stored in or exposed to rain, water, dust, dirt, or snow are not acceptable.

1.2 APPROVAL OF MATERIALS

- A. Electrical materials shall be of the type and quality indicated, new, listed by the Underwriters' Laboratories, and shall bear their label wherever standards have been established and they regularly furnish label service.

1.3 MANUFACTURER

- A. Like items shall be from one manufacturer i.e., fixture types, switches, receptacles, breakers, panels, etc.

1.4 OPERATING AND MAINTENANCE MANUALS

- A. Prior to completion of the job and before final payment, the Contractor shall furnish the Owner three (3) sets of operating and maintenance brochures for equipment installed. Operating and maintenance brochures shall include descriptive and technical data, maintenance, and operation procedures, wiring diagrams, spare parts lists, service representative, supplier for replacement parts, etc.
- B. Assemble data into individual sets and bind into plastic-covered, hard backed, loose-leaf binders arranged for side binding. Segregate respective items into related groups (starters, fixtures, etc.) and provide index tab for each group.
- C. At the completion of project, and at a time scheduled by the Architect, assemble key mechanics, vendors, factory representatives and similar personnel required to explain all facets of maintenance and operation of the installed system to the operating personnel. Instructions shall include actual operation of systems and methods of maintenance.
- D. Provide all incidentals, hangers, brackets, supports, framing, backing, signal transformers, relays, etc. required to complete the system or systems, in a safe and satisfactory Working condition, shall be provided and installed as part of this Work.
- E. All openings associated with this Work shall be sealed with EPO-TEC product number 200.

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1.5 ELECTRICAL IDENTIFICATION

- A. Provide Raychem ShrinkMark system Cable Markers.
- B. Nameplates shall be engraved three-layer laminated plastic, white letters on black background.

1.6 WIRING METHOD

- A. Wiring throughout area shall be metallic raceway system with flush mounted outlets, cabinets, panels, etc.
- B. All Work shall be executed in a Workmanlike manner and shall present a neat and mechanical appearance upon completion.
- C. Cable and tree all wiring in panels, enclosures, and cabinets; for power, and signal. Use plastic ties in panels, enclosures, cabinets, and all open cable or wire installations.
- D. Wet, and Damp Location: Comply with Code requirements.
- E. Recondition or replace any damage to this Work or other crafts.

1.7 ELECTRICAL DESIGN CRITERIA

- A. Branch circuit loading shall be as follows:
 - 1. Convenience outlets shall be calculated based upon a minimum of 200 volt-amperes per device. A maximum of 1,400 volt-amperes per 20-ampere 120V branch circuit shall be used.
 - 2. Maximum lighting load per 20-ampere 120V branch circuit shall not exceed 1,500 volt-amperes.
- B. Devices:
 - 1. Electrical device locations are indicated on the Architectural Drawings.
 - 2. Branch circuits requiring extending and demolition shall be documented on Design/Build Drawings.
- C. Lighting and Controls:
 - 1. Fixtures in the lighting system: See Section 265000.
 - 2. The average illumination level shall be designed at thirty (30) foot-candles thirty (30) inches above finished floor.
 - 3. The fixtures shall have built-in emergency-light and battery back-up, as noted on the Drawings, and shall be approved by the Architect.
 - 4. Lighting control design shall conform to the requirements of 2018 WSEC. Manual stations shall be flush or semi-flush pushbutton type. Occupancy / Vacancy sensors shall be dual technology type with adjustable time delay with auxiliary contacts for exhaust fan on / off control. Daylight control sensors shall be equipped with adjustable sensitivity.

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D. Fire Alarm:

1. System design modifications shall be made in compliance with Local Fire Marshal approval.
 - a. Fire alarm system for Project Area is to be separate zone as required by Fire Marshal.

E. Construction Documents:

1. Provide neat, legible design scaled drawings to the Architect. Drawings to include symbol schedule, power, lighting, and fire alarm system wiring details.
2. The electrical devices will be shown on the Drawings circuited with home runs to respective panels. The phase conductor shall be shown as small line, the neutral conductor shall be shown as a larger line, and the ground conductor shall be shown as in figure 1.



Figure 1

3. There shall be a lighting floor plan with fixtures, controls, and branch circuiting shown.
4. There shall be one power and signal floor plan with device and fire alarm branch circuiting shown.
5. Provide symbol, fixture, and panel schedules on the Drawings.
6. Provide lighting calculations either attached to the Drawings or on 8 1/2" X 11" paper.
7. Record Drawings shall show all fixtures with types and all electrical devices with circuit numbers.

1.8 LOCATION AND INSTALLATION

- A. Distance of device outlet boxes above finished floor shall comply with ADA Disabilities Act, and at locations approved by the Architect.

1.9 ELECTRICAL IDENTIFICATION

- A. Degrease and clean surfaces to receive nameplates and tape labels.
- B. Install nameplates and tape labels parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panel board doors in finished locations.
- D. Install branch circuit tape labels inside duplex receptacle finish plates.

1.10 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates to identify all electrical power distribution, fire alarm, and receptacles. Letter Height shall be 1/4 inch for main distribution panel, panel boards, and disconnect switches, and 1/8 inch for all other equipment.

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1.11 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor at load connections, panel boards, pull boxes, enclosures, and cabinets.

1.12 SUPPORTS

- A. Conduits shall be supported from the structure. Penetration of roof deck is not permitted for hangers, clamps, etc. Provide metal conduit, pipe hangers/supports, and straps. Supports to provide (5) times ultimate weight of equipment to be supported.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 260500

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SECTION 261100 – CONDUITS, RACEWAYS, BOXES AND FITTINGS (Performance Specification)

PART 1 – GENERAL

1.1 CONDUITS AND SURFACE METAL RACEWAY SYSTEMS

- A. Provide Raceways and Conduits of specified types for all Electrical System Wiring. All Fittings, Boxes, Hangers and Appurtenances shall be included.
- B. Manufacturer: Triangle, National, Allied, Carlon, Greenfield or approved.
 - 1. Zinc coated Steel Electrical Metallic Tubing (E.M.T.).
 - 2. Galvanized, interlocked Steel, flexible metallic Conduit and liquid tight.
 - 3. Rigid non-metallic (SCH 40 PVC) for under slab conduit.
 - 4. Galvanized Rigid Conduit (GRC) for overhead service masts, exterior work and conduit exposed to physical damage.

1.2 FITTINGS

- A. Manufacturer: Appleton, Efcor, Midwest, Raco, T & B, Steel City or approved.
 - 1. Threaded, insulated throat or plastic Bushings.
 - 2. Insulated grounding Bushings.
 - 3. Flex Connectors shall be malleable squeeze type.
 - 4. E.M.T. Steel Set Screw Connectors and/or Couplings.

1.3 FASTENERS

- A. Manufacturer: Caddy, Minerallac or approved.
 - 1. Con clips for support of Thin-wall Conduit or flexible metallic Conduit.
 - 2. Conduit Clips for support of Conduit outside Beams.
 - 3. EMT two-hole Straps for support of Conduit from structure.
 - 4. EMT Jiffy Clips for support of Flex Conduit.

1.4 BOXES

- A. Manufacturer: Raco, Steel-City, Bell, Hubbell, Appleton or approved.
 - 1. Galvanized stamped steel with screw ears and knock out plugs, mounting type as required, 4" W x 1 1/2" D minimum.
 - 2. Boxes exposed to weather and installed in contact with earth shall be cast iron alloy with gasketed screw cover and watertight hubs.
 - 3. Solid gang box covers single, double as required and 3/4 inch.
 - 4. Boxes exceeding 4 - 11/16-inch square shall be welded steel construction with screw cover.
 - 5. Mud ring depth to be coordinated with finished materials depth.

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1.5 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Conceal all Conduits in finished spaces.
- B. All conduits are to be securely supported and fastened at six (6) foot intervals and within eighteen (18) inches of every outlet, ell, and panel termination. Conduit runs, which are grouped together or larger than 1-1/4 inch, are to be supported from building structure by Kindorf or Unistrut steel channel.
- C. Conduit may be sized to the minimum National Electric Code. Minimum conduit trade size shall be 1/2 inch.
- D. Maintain minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

1.6 CONDUIT INSTALLATION

- A. Flexible metal conduit shall be installed at ventilating equipment.
- B. All conduits shall be cut square, reamed smooth, and with all fittings drawn up tight.
- C. Jacket flexible metal conduit shall be installed at locations exposed to weather or damp areas.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 261100

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SECTION 261200 – CONDUCTORS AND CONNECTORS (Performance Specification)

PART 1 – GENERAL

1.1 CONDUCTORS

- A. Manufacturer: Cerro, Encore, Houston, Southwire, Superior Essex, or Architect accepted equal.
- B. All Branch Circuit and Feeder Conductors shall be 600-volt insulation, Aluminum.
- C. Insulation types approved shall be THW, THHN, and THWN. Number 8 and larger shall be stranded Class B.
- D. The minimum Conductor size shall be number 12 AWG unless otherwise specified herein.
- E. Color-code all Feeder and Branch Circuit Conductors in a consistent phase-to-phase manner. Phases A-B-C left-to-right and phases A-B-C top-to-bottom.
- F. Color coding of conductors:

Phase-to-Phase Voltage	Phase A	Phase B	Phase C	Neutral	Ground
Under 250-volts	Black	Red	Blue	White	Green

1.2 CONNECTORS

- A. Branch Circuit Connectors shall be Scotch-Lok, Ideal Wire Nut, and Scotch 3M or approved.

1.3 CABLE SPLICES

- A. Split-bolt, compression terminal, tool applied sleeves, Burndy, Kearney or approved.
- B. Vinyl plastic electrical tape, flame-retardant, equal to Scotch #33 or approved.
- C. Termination lugs for number 12 AWG conductors and/or smaller shall be spade-flared tool applied.

1.4 GENERAL WIRING METHODS

- A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
- B. Use 10 AWG conductors for 20 ampere, 120-volt branch circuit home runs longer than 75 feet.
- C. Place an equal number of conductors for each phase of a circuit in same raceway.
- D. Splice only in junction or outlet boxes.
- E. Neatly train and lace wiring inside boxes, equipment, and panel boards.

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- F. Make conductor lengths for parallel circuits equal.

1.5 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Use suitable cable fittings and connectors.
- C. Conductors routed through fixtures, mounted in a continuous row shall have an insulation rating not less than 90° Celsius. Conductors shall be rated as fixture wire.

1.6 WIRING CONNECTIONS AND TERMINATIONS

- A. Make splices, taps and terminations to carry full capacity of conductors without perceptible temperature rise.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 261200

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SECTION 261400 – WIRING DEVICES AND PLATES (Performance Specification)

PART 1 – GENERAL

1.1 MATERIALS

- A. Wiring Devices shall be specification grade, Ivory color.
- B. Acceptable grade Devices to those specified will be Pass & Seymour, Leviton, Hubbell or equal. All Lighting Switches and Duplex Receptacles installed shall be of the same Manufacturer and have identical appearance.
- C. Receptacles:
 - 1. Duplex 20 ampere, 3-wire, 2-pole Grounding. Hubbell 5362 series, Leviton 5362 series or equal.

1.2 INSTALLATION

- A. Install wall switches with OFF position down.
- B. Install wall mounted convenience receptacles grounding pole on bottom.
- C. Install devices and wall plates flush and level.
- D. Devices and Finish Plates shall be installed, plumb with Building lines. Finish Plates and Devices shall not be installed until final painting is complete. Scratched or splattered Finish Plates and Devices will not be accepted.
- E. Receptacles shall be tested for polarity.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 261400

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SECTION 264000 - SERVICE, METERING, DISTRIBUTION AND PANELBOARDS (Performance Specification)

PART 1 - GENERAL

1.1 SERVICE

A. New Service Panel:

1. New Service Panel:

- a. Set new service panel as noted on Drawings per Owner request.
- b. Panel shall have main circuit breaker and sub breakers to feed all devices and equipment. See Drawings for service sizing calculations. Load calculations suggest a service rated 400A, 1-phase.
- c. Provide provisions for 3 additional future breakers 225-amp frame size.
- d. Provide surge suppressor for panel, external mount, connect to dedicated circuit breaker. The manufacturer of the SPD's shall conform to UL 1449 (latest edition), be the same as the manufacturer of the service entrance and distribution equipment in which the devices are installed and have a minimum surge current rating of 100kA per phase (60kA per mode).

2. Mount CT and meter outside of the building, opposite of the new panel.

3. New Weather Head and Overhead Service:

- a. Provide new weather head and overhead service and service feeders as required; coordinate closely with Electrical Utility.
- b. All roof penetration work shall be coordinated with roofing manufacturer to retain roof warranty.

4. New Conduit and Feeders:

- a. Provide new conduit and aluminum feeders with full sized neutral and equipment ground wire routed inside of the building to each of the existing service panels which remain and to any new/relocated panels.
- b. Coordinate cut over to the new panel closely with the County and minimize down time. Assume work during off hours.
- c. Remove all panels, meter banks, meters, conduit weather head, and wire associated with the service change and re-feeding of existing electrical panels. All roof related work shall be coordinated with roofing manufacturer to retain roof warranty.
- d. Provide all paint, patch and building and site repair as required for removed equipment, panels, meter bank, weather head, conduit, etc.

B. Coordinate electrical service connections with serving utility representative.

C. Obtain available short circuit current from utility and provide system rated to withstand this value plus 25 percent.

D. Include in Bid all Utility line extension / connection charges and fees for this Project. Reference utility contacts list on Drawings and obtain detailed charges from serving utility.

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1.2 PANELBOARDS

- A. Reference Attachments to this Section for schedules.
- B. Provide labeling per Section 260500.

1.3 SUBMITTALS

- A. Submit complete and descriptive electronic shop drawings of Main Service Disconnects, Distribution Panelboard and Branch Panelboards. Submittal shall include Contractor's proposed layout (1/2" = 1'-0" scale or dimensioned) of equipment in available space.
- B. Submit Operating and Maintenance Instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. SQUARE D, SEIMENS, ABB, CUTLER-HAMMER.
- B. Architect Approved Alternative.

2.2 MAIN SERVICE DISCONNECTS

- A. Molded Case Circuit Breaker (800 amp and smaller): NEMA AB 1
- B. Provide ONE-LINE Drawing to meet requirements.

2.3 UTILITY METERING

- A. Cooperate with serving utility to install equipment furnished by utility.
- B. Run 1.5" Rigid metal conduit (RMC) from CT cabinet to remote mounted CT Meter base.

2.4 DISTRIBUTION BOARDS (400 TO 800 AMP)

- A. Distribution Panelboards: NEMA PB 1, circuit breaker as indicated on Drawings.
- B. Enclosure: Type 1, screw cover, standard finish.
- C. Bussing: Copper with tin plating. Half ground bus.
- D. Voltage, amperage and integrated equipment rating as shown on Drawings.
- E. Circuit Breakers: NEMA AB 1.

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2.5 BRANCH PANELBOARDS (225 AMP AND BELOW)

- A. Panelboards: NEMA PB-1, circuit breaker type.
- B. Cabinets: Type 1; galvanized steel with standard spray finish, mono-flat front trim, and door. Doors: Flush-type lock latches, all keyed alike. Furnish two keys with each lock. Trims to be separately packed and protected from scratching and marring.
- C. Bus: Copper, suitable for bolt-on circuit breakers. Provide grounding bus for connection of grounding conductors. Provide isolated ground bus for panelboards as noted on Drawings.
- D. Circuit Breakers: Not less than 3/4-inch on centers; securely fastened to prevent movement; rated not less than 10000 Aic at 240 volts but shall be series rated with Distribution and Main service gear to withstand available fault currents.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Conform to serving utility requirements.
- B. Follow manufacturer's installation instructions.

END OF SECTION 264000

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SECTION 264500 - GROUNDING (Performance Specification)

PART 1 – GENERAL

1.1 SYSTEM DESCRIPTION

- A. Ground equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, and duplex receptacle grounds. Provide grounding electrodes and conductors, etc.

1.2 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 264500

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SECTION 265000 – LIGHTING (Performance Specification)

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide luminaires with LED arrays, drivers and supports as herein specified and as shown on the Drawings.

1.2 QUALITY ASSURANCE

- A. If the catalog number of a specified luminaire conflicts with the luminaire description or these Specifications, then bring such conflicts to the attention of the Architect prior to bidding.

1.3 SUBMITTALS

- A. Submit complete and descriptive shop drawings in accordance with Section 260000. Include a master list of luminaires used on project showing: Luminaire type, brief description, luminaire manufacturer and catalog number, driver manufacturer and catalog number and LED array manufacturer and catalog number.
- B. Verify that luminaire description matches the specified catalog number.
- C. Indicate on the submitted items the features mentioned in the luminaire list.
- D. Boldly indicate delivery lead-time for each luminaire type and critical path order date.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. See Lighting Schedules on Drawings for acceptable manufacturers.
- B. Requests for substitution of other products will be considered if submitted in accordance with Section 012500.
- C. Substitution requests must include Luminaire construction data (printed data sheet) and IES format photometric data. Requests lacking this data will be rejected.

2.2 MATERIALS

- A. Steel: Painted before or after fabrication. No exposed sharp edges allowed.
- B. Aluminum: Formed sheet or cast, polyester powder coat painted.
- C. Acrylic prismatic lenses: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- D. Polycarbonate lenses & housings: UV and heat stabilized.
- E. Glass lenses: tempered, shatter resistant.

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2.3 LED ARRAYS

- A. LED arrays shall have 4100 Degree Kelvin phosphor color and a minimum CRI of 85 unless noted otherwise in Lighting Schedules.
- B. Acceptable driver manufacturers: GENERAL ELECTRIC, OSRAM SYLVANIA, and PHILIPS.
- C. All LED arrays are to comply with UL 8750.
- D. All LED arrays and luminaires shall be in proper operation at the time of acceptance.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Luminaires installed under this work shall be properly and adequately supported from the building structure, except where ceiling construction or other provisions are specifically designed to support the luminaire units. Provide seismic supports and bracing per local code requirements.
- B. Luminaire supports shall provide proper alignment and leveling of luminaires and shall be arranged to always maintain the alignment. The Architect shall give the final decision as to adequacy of support and alignment.
- C. All light outlets shall be supplied with a luminaire. Outlet symbols on the Drawings without a type, designation shall have a luminaire the same as those used in similar or like locations.
- D. Luminaires shall be left clean at the time of acceptance of the work and every LED array shall be in operation. The responsibility for cleaning or protecting luminaires from dirt, dust, paint, debris, etc., shall rest with the Contractor performing this Division of work.
- E. Where luminaires are mounted under cabinets, in soffits, coves, or other physically restricting spaces, the Contractor shall verify that the luminaires will fit the space prior to ordering.

END OF SECTION 265000

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SECTION 311000 - SITE CLEARING

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. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Temporary erosion- and sedimentation-control measures.

B. Related Sections:

1. Section 015000 "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security, and protection facilities.
2. Section 017300 "Execution" for field engineering and surveying.

1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

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1.5 QUALITY ASSURANCE

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

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- D. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

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- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

- A. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.5 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

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SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Preparing sub-grades for slabs-on-grade.
- 2. Excavating and backfilling for buildings and structures.
- 3. Drainage course for concrete slabs-on-grade.

B. Related Sections:

- 1. Section 013200 "Construction Progress Documentation" for recording pre-excavation and earth moving progress.
- 2. Section 015000 "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; and for temporary site fencing if not in another Section.
- 3. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
- 4. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.3 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
- B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- C. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- D. Excavation: Removal of material encountered above sub-grade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 - 3. Unauthorized Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- E. Fill: Soil materials used to raise existing grades.

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- F. Rock: Rock material in beds, ledges, un-stratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, or ripping, when permitted:
 - 1. Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom; measured according to SAE J-1179.
 - 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- G. Structures: Buildings, footings, foundations, slabs, or other man-made stationary features constructed above or below the ground surface.
- H. Sub-Grade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below drainage fill, drainage course, or topsoil materials.
- I. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to ASTM D 698.
- C. Pre-Excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.
- B. Pre-Excavation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

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- B. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earth moving operations.
- C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 311000 "Site Clearing," are in place.
- D. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other, digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- E. Do not direct vehicle or equipment exhaust towards protection zones.
- F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Drainage Course: Narrowly graded mixture of washed crushed stone or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- G. Sand: ASTM C 33; fine aggregate.

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PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect sub-grades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to sub-grade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 12 inches outside of concrete forms at footings.
 - b. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - c. 6 inches beneath bottom of concrete slabs-on-grade.
- B. Classified Excavation (if required): Excavate to sub-grade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by professional engineer, licensed in the State of Washington. The Contract Sum may be adjusted for rock excavation according to contract provisions included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
 - 1. Earth excavation includes excavating obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
 - 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and sub-grade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 12 inches outside of concrete forms at footings.
 - b. 6 inches outside of minimum required dimensions of concrete cast against grade.

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- c. 6 inches beneath bottom of concrete slabs-on-grade.

3.4 EXCAVATION FOR STRUCTURES

- A. Excavate, to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.5 SUBGRADE INSPECTION

- A. Notify Owner when excavations have reached required sub-grade.
- B. If Owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll sub-grade below the building slabs with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated sub-grades.
 - 1. Completely proof-roll sub-grade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner, without additional compensation.

3.6 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

3.7 STORAGE OF SOIL MATERIALS

- A. Stockpile, borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

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3.8 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade.
 - 2. Removing concrete formwork.
 - 3. Removing trash and debris.
- B. Place, backfill on sub-grades free of mud, frost, snow, or ice.

3.9 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal, so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under building slabs, use engineered fill.
 - 2. Under footings and foundations, use engineered fill.
- C. Place, soil-fill on sub-grades free of mud, frost, snow, or ice.

3.10 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate sub-grade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place, backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place, backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under structures and building slabs, scarify and re-compact top 12 inches of existing sub-grade and each layer of backfill or fill soil material at 95 percent.

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3.12 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish sub-grades to required elevations.
- C. Grading inside Building Lines: Finish sub-grade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.13 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on sub-grades free of mud, frost, snow, or ice.
- B. On prepared sub-grade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Place drainage course 6 inches or less in compacted thickness in a single layer.
 - 2. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.14 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - 2. Determine that fill material and maximum lift thickness comply with requirements.
 - 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test sub-grades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Sub-Grade: At footing sub-grades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing sub-grades may be based on a visual comparison of sub-grade with tested sub-grade when accepted by Owner.

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- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Building Slab Areas: At sub-grade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of building slab, but in no case fewer than three tests.
- F. When testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified, scarify, and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

3.15 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified, tolerances where completed, or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000