

Kitchen Equipment Replacement

Package 2

Leander ISD

Leander, Texas

Project Manual

Issued For

Contract Documents



O'CONNELL ROBERTSON

Project Number: 2512.00

11.12.25

SECTION 00 01 07

SEALS PAGE

ARCHITECT OF RECORD

O'Connell Robertson
811 Barton Springs Road, Suite 900
Austin, Texas 78704



Architect of Record

Date

MECHANICAL ENGINEER OF RECORD

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Austin, Texas 78704
TBPE Registered Firm No. F-2708



Mechanical Engineer of Record

Date

ELECTRICAL ENGINEER OF RECORD

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Electrical Engineer of Record

Date

PLUMBING ENGINEER OF RECORD

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Plumbing Engineer of Record

Date

FOOD SERVICE CONSULTANT OF RECORD

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The Woodlands, Texas 77380



Food Service Consultant of Record

Date

END OF DOCUMENT

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SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Work covered by Contract Documents.
 - 2. Work performed by Owner.
 - 3. Contractor's use of site and premises.
 - 4. Work restrictions.
 - 5. Specification and Drawing conventions.

1.3 DEFINITIONS

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - 1. Package 2: Replacement of ice machines and roof top condensing units at Rouse HS, Vandegrift HS, and Vista Ridge HS and other Work indicated in the Contract Documents.
 - 2. Package 3: Replacement of dish washers at Rutledge ES, Steiner Ranch ES, and Vista Ridge HS
 - 3. Package 4: Replacement of walk-in coolers and cooler condensing units at Cypress ES, Faubion ES, Giddens ES, Knowles ES, Leander MS, Running Brushy MS, and Steiner Ranch ES
 - 4. Package 5: Replacement of serving lines at Bagdad ES, CC Mason ES, Cedar Park MS, Cypress ES, Faubion ES, Giddens ES, Leander MS, and Steiner Ranch ES

1.5 WORK PERFORMED BY OWNER

- A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways, parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for 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.

- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to hours approved by Owner. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
- 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 arranging for 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, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, 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. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, 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 use identification tags at all times.
- 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 when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 - 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.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying 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 form provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of 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 substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as 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 substitutions 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 through Construction Manager 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. Submit Substitution Requests with clearly defined "Cause" in compliance with this specification section.
 - 1. If a Substitution request is approved, compliance with Section 01 33 00 "Submittal Procedures" is required, in addition to specific submittal requirements specified in individual specification sections.

1.7 SUBSTITUTIONS

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

**PACKAGE 2
CONTRACT DOCUMENTS
NOVEMBER 12, 2025**

**KITCHEN EQUIPMENT REPLACEMENT
PROJECT NO. 2512.00**

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SUBSTITUTION REQUEST

BIDDING PHASE

PROJECT: 2512.00 Package 2 Kitchen
Equipment Replacement

TO (ARCHITECT):
O'Connell Robertson

FROM (BIDDER):

HEREBY REQUESTS ACCEPTANCE OF THE FOLLOWING PRODUCT OR SYSTEMS AS A
SUBSTITUTION IN ACCORD WITH PROVISIONS OF THE BIDDING DOCUMENTS:

1. SPECIFIED PRODUCT OR SYSTEM:

Substitution request for (Generic Description):

Specification Section No. _____ Article(s) _____ Para(s) _____

2. SUPPORTING DATA:

☐ Product data for proposed substitution is attached (description of product, reference standards, performance and test data).

☐ Sample is attached

☐ Sample will be sent if requested

3. QUALITY COMPARISON:

	SPECIFIED PRODUCT	SUBSTITUTION
Name,brand:	_____	_____
Catalog No.:	_____	_____
Manufacturer:	_____	_____
Vendor:	_____	_____
Significant variations:	_____	_____

Maintenance Service Available: ☐ yes ☐ no

Spare Parts Source: _____

4. PREVIOUS INSTALLATIONS:

Identification of similar projects on which proposed substitution was used: (Attach list)

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

5. REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEMS:

6. EFFECT OF SUBSTITUTION:

Proposed substitution affects other parts of Work: ☐ No ☐ Yes (If yes, explain)

Substitution requires dimensional revision or redesign of structure or M & E Work:

☐ No ☐ Yes (If yes, attach complete data.)

7. BIDDER'S/SUPPLIER'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:

- I/we have investigated the proposed substitution. I/we:
- believe that it is equal or superior in all respects to specified product, except as stated above; and
 - ☐ will provide the same warranty as specified for specified product; and
 - ☐ have included complete implications of the substitution; and
 - ☐ will pay redesign and other costs caused by the substitution which subsequently become apparent; and
 - ☐ will pay costs to modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning resulting from the substitution.
 - ☐ warrant and represent to the Owner and the Architect that the proposed substitution does not infringe on any patents or other rights held by others, or that a license has been or will be obtained timely from the holders of such rights for the use of the substitute as proposed; and acknowledge that by accepting this substitution neither the Architect nor the Owner makes any warranty or representation to the Contractor or any Subcontractor regarding the existence or potential for such infringement.

Bidder/Supplier: _____

Date: _____

By: _____

Answer all questions and complete all blanks - use "NA" if not applicable.

REVIEW AND ACTION:

- ☐ Substitution Approved – Make submittals in accordance with Specification Section 01 25 00 "Substitution Procedures"
- ☐ Substitution approved as noted – Make submittals in accordance with Specification Section 01 25 00 "Substitution Procedures".
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution request received too late – use specified materials.

Architect/Engineer Signature

Date

SUBSTITUTION REQUEST

AFTER EXECUTION OF CONTRACT

PROJECT: 2512.00 Package 2 Kitchen
Equipment Replacement

TO (ARCHITECT):
O'Connell Robertson

FROM (CONTRACTOR):

HEREBY REQUESTS ACCEPTANCE OF THE FOLLOWING PRODUCT OR SYSTEMS AS A
SUBSTITUTION IN ACCORD WITH PROVISIONS OF DIVISION ONE OF SPECIFICATIONS:

1. SPECIFIED PRODUCT OR SYSTEM:

Substitution request for (Generic Description):

Specification Section No. _____ Article(s) _____ Para(s) _____

2. SUPPORTING DATA:

☐ Product data for proposed substitution is attached (description of product, reference standards, performance and test data).

☐ Sample is attached

☐ Sample will be sent if requested

3. QUALITY COMPARISON:

	SPECIFIED PRODUCT	SUBSTITUTION
Name,brand:	_____	_____
Catalog No.:	_____	_____
Manufacturer:	_____	_____
Vendor:	_____	_____
Significant variations:	_____	_____

Maintenance Service Available: ☐ yes ☐ no

4. PREVIOUS INSTALLATIONS:

Identification of similar projects on which proposed substitution was used: (Attach list)

Project: _____

Architect: _____

Address: _____

Owner: _____

Date Installed: _____

5. REASON FOR NON-AVAILABILITY OF SPECIFIED ITEM:

Attach affidavit, certification or other data as proof of non-availability.

- ☐ Strikes
- ☐ Lockouts
- ☐ Bankruptcy

- ☐ Discontinuance of production
- ☐ Proven shortage
- ☐ Similar occurrences (explain below)

6. EFFECT OF SUBSTITUTION:

Proposed substitution affects other parts of Work: ☐ No ☐ Yes (If yes, explain)

Substitution changes Contract Time: ☐ No ☐ Yes Add/Deduct _____ day

Substitution requires dimensional revision or redesign of structure or M & E Work:

☐ No ☐ Yes (If yes, attach complete data.)

Saving or credit to Owner, if any, for accepting substitution: \$.

7. CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:

I/we have investigated the proposed substitution. I/we:

- ☐ believe that it is equal or superior in all respects to specified product, except as stated above;
- ☐ will provide the same warranty as specified for specified product;
- ☐ have included complete cost data and implications of the substitution;
- ☐ will pay redesign and special inspection costs caused by the use of this product;
- ☐ will pay additional costs to other contractors caused by the substitution;
- ☐ will coordinate the incorporation of the proposed substitution in the Work;
- ☐ will modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning;
- ☐ waive future claims for added cost to Contract caused by the substitution;
- ☐ warrant and represent to the Owner and the Architect that the proposed substitution does not infringe on any patents or other rights held by others, or that a license has been or will be obtained timely from the holders of such rights for the use of the substitute as proposed; and acknowledge that by accepting this substitution neither the Architect nor the Owner makes any warranty or representation to the Contractor or any Subcontractor regarding the existence or potential for such infringement.

Contractor: _____ Date: _____

By: .

Answer all questions and complete all blanks - use "NA" if not applicable.

ARCHITECT'S REVIEW AND ACTION:

- ☐ Substitution Approved – Make submittals in accordance with Specification Section 01 25 00 "Substitution Procedures"
- ☐ Substitution approved as noted – Make submittals in accordance with Specification Section 01 25 00 "Substitution Procedures".
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution request received too late – use specified materials.

Architect/Engineer Signature

Date approval from the A/E.

SECTION 01 26 00 - 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.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

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 10 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.
- 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 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request (PR), Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

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 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.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.
 - 3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 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. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. 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.
6. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
7. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
9. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 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 pdf file of each Application for Payment to Architect by a method ensuring receipt.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. Include the following with each Application for Payment:
 1. Construction progress schedules, revised and current, as specified in Section 01 33 00 – Submittal Procedures.
 2. Periodic Construction Photographs, as specified in Section 01 32 33 "Photographic Documentation." Provide number of photos required to substantiate completed Work, as well as photographs of procured stored materials.
 3. Affidavits attesting to off-site stored products.
 4. As stipulated in the Agreement, submit partial release of liens from major Subcontractors and vendors.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Schedule of unit prices.
 6. Submittal schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.

- J. 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.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 77 00 "Closeout Procedures."
 - 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. 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. Certification of completion of final punch list items.
 - 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 4. Updated final statement, accounting for final changes to the Contract Sum.
 - 5. AIA Document G706.
 - 6. AIA Document G706A.
 - 7. AIA Document G707.
 - 8. Evidence that claims have been settled.
 - 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 - 10. Final liquidated damages settlement statement.
 - 11. Proof that taxes, fees, and similar obligations are paid.
 - 12. Waivers and releases.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Web-based Project management software package.
 - 6. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. 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, telephone number, and email address 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, 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 in prominent location in each built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Information Exchange: Architect uses Newforma for Construction Administration information exchange with the Contractor, including RFIs, Submittals, Proposed Change Orders and Change Order Requests.

- B. 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.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings 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 Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor

dimension changes and difficult installations will not be considered changes to the Contract.

- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Architect will review coordination drawings to confirm that, in general, 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 suitable modifications and resubmit.
 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format:
 - a. Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using PDF format.
 3. Architect will furnish Contractor one set of pdf 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.

1.7 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Owner name.
 - 3. Owner's Project number.
 - 4. Name of Architect.
 - 5. Architect's Project number.
 - 6. Date.
 - 7. Name of Contractor.
 - 8. RFI number, numbered sequentially.
 - 9. RFI subject.
 - 10. Specification Section number and title and related paragraphs, as appropriate.
 - 11. Drawing number and detail references, as appropriate.
 - 12. Field dimensions and conditions, as appropriate.
 - 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 14. Contractor's signature.
 - 15. 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: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to Architect.
 - 1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven 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 by Architect of additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number, including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- 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.

1.8 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 a minimum of 10 days prior to meeting.
 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. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.

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

- x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - l. Coordination of separate contracts.
 - m. Owner's partial occupancy requirements.
 - n. Installation of Owner's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at regular intervals as defined by Project.
- 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority 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 sustainable design documentation.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 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.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

- G. Resource Loading: The allocation of manpower and equipment necessary for completing 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.
 - 2. PDF file.
- B. Startup construction schedule.
 - 1. Submittal 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 digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- 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 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 each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 - 3. Total Float Report: List of activities sorted in ascending order of total float.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at monthly intervals.
- H. Material Location Reports: Submit at monthly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.
- J. Unusual Event Reports: Submit at time of unusual event.
- K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.

2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including work stages interim milestones and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.
 - d. Owner interfaces and furnishing of items.
 - e. Interfaces with Separate Contracts.
 - f. Regulatory agency approvals.
 - g. Punch list.
 3. Procurement Activities: Include procurement process activities for the following long lead-time 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.
 4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.

6. Commissioning Activities: Coordinate with the commissioning authority and schedule all sequences of work required to complete the commissioning process for all pertinent systems and equipment, including any start-up activities such as energization, third-party testing, flushing and passivation, manufacturer start-ups, test and balance, networking, controls integration, and functional performance testing. The commissioning process shall be coordinated and scheduled in such a way as to allow for all functional performance testing and Owner training to be completed prior to Substantial Completion.
 7. 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.
 8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. 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. Partial occupancy before Substantial Completion.
 - b. Use-of-premises restrictions.
 - c. Seasonal variations.
 - d. Environmental control.
 2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 - n. Commissioning.
- E. 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.
- F. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.
- G. 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 the Contract Time.
- H. 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.
- I. 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, equipment required to achieve compliance, and date by which recovery will be accomplished.
- J. 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.

1.8 CPM SCHEDULE REQUIREMENTS

- A. 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 60 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 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.
 2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule 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.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.

- b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and inspection.
 - j. Commissioning.
 - k. Punch list and Final Completion.
 - l. Activities occurring following Final Completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

1.9 REPORTS

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

Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

- D. Unusual Event Reports: 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, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one day(s) of an occurrence.
Distribute copies of report to parties affected by the occurrence.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 33 - PHOTOGRAPHIC 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 the following:
 - 1. Preconstruction photographs.
 - 2. Concealed Work photographs.
 - 3. Periodic construction photographs.
 - 4. Final Completion construction photographs.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos by uploading to Newforma Info Exchange site. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C. Metadata: Record accurate date and time from camera.
- D. File Names: Name media files with date, Project area and sequential numbering suffix.

1.6 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag excavation areas and construction limits before taking construction photographs.
 - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
 - 1. Underground utilities.
 - 2. Underslab services.
 - 3. Piping.
 - 4. Electrical conduit.
 - 5. Waterproofing and weather-resistant barriers.
- E. Periodic Construction Photographs: Take 50 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken. Comply with Section 01 29 00 "Payment Procedures."
- F. Final Completion Construction Photographs: Take 50 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.
- G. Additional Photographs: Architect may request photographs in addition to periodic photographs specified.
 - 1. Three days' notice will be given, where feasible.
 - 2. In emergency situations, take additional photographs within 24 hours of request.
 - 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs shall be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

**PACKAGE 2
CONTRACT DOCUMENTS
NOVEMBER 12, 2025**

**KITCHEN EQUIPMENT REPLACEMENT
PROJECT NO. 2512.00**

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal Schedule: 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 Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required 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 dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.

2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.
 15. Remarks.
 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
1. Comply with Section 01 25 00 "Substitution Procedures" for products by manufacturers not listed in individual specification sections.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Newforma Info Exchange: Prepare submittals in PDF format, and send via Newforma Info Exchange. Enter required data in Newforma Info Exchange to fully identify submittal.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. Submittals received by Architect after 1:00pm will be considered as received the following working day. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

- A. Include a copy of applicable Specification Section in every submittal.
- 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 unsuitable 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 that show 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 Shop Drawings, and before or concurrently with Samples.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.

- d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- D. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
- 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 - 3. 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 not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Where product and material selections are not scheduled on Finish Schedule, or where materials are indicated to "match existing," 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(s) 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.
 - 5. 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 number of Sample sets indicated below as a minimum to Architect for verification. Architect will retain one approved sample. Mark up and retain one approved Sample set as a project record Sample on site.
 - 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.
 - 3) For natural stone finish or cladding materials, submit a range sample set including at least five samples to capture the expected range in variation of stone material.
- 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.
- F. 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.
- G. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- H. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. 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.
 3. 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.
 4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- I. Test and Research Reports:
1. 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 substrate preparation and primers required.
 2. 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.
 3. 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.
 4. 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.
 5. 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.

6. 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:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.7 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 insufficient 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 file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

- A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S AND ENGINEER'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required.
 1. Submittals by Newforma Info Exchange: Architect will indicate, via Newforma Info Exchange, the appropriate action.
 2. Submittal Actions:
 - a. No Exceptions Taken: The submittal is acceptable as submitted and no changes are necessary. No re-submittal is required.
 - b. Exceptions Noted: All notations marked on the submittal must be addressed. No re-submittal is required.
 - c. Exceptions Noted, Resubmit: All notations marked on the submittal must be addressed and re-submitted for review. Submit new drawings or data with notations incorporated.
 - d. Rejected: The submittal does not conform with the Contract Documents and must be re-submitted.

- e. For Record Only: Submittal required or submitted for record. No action is required.
 - f. Pending Additional Information: Submittal is incomplete and lacks information required per specifications. Submit the requested information for review.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not included in this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, 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.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. 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, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
 - 1. Mockups are used for one or more of the following:
 - a. Verify selections made under Sample submittals.
 - b. Demonstrate aesthetic effects.
 - c. Demonstrate the qualities of products and workmanship.
 - d. Demonstrate successful installation of interfaces between components and systems.
 - e. Perform preconstruction testing to determine system performance.
 - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.

- 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. 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. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. 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.
- J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is 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.

1.6 ACTION SUBMITTALS

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

1.7 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 submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- 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.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, 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.

1.8 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 and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

- B. **Quality-Control Personnel Qualifications:** Engage qualified 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 does not have other Project responsibilities.
- C. **Submittal Procedure:** Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. **Testing and Inspection:** In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 - 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.
- 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 the 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.

1.9 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, telephone number, and email address 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 inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.

13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 1. Name, address, telephone number, and email address 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 of whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 1. Name, address, telephone number, and email address 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 of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

- A. 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- 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, applying, 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 is similar in material, design, and extent to those indicated for this Project.

- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- 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, demonstrate, repair, and perform service on installations 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 Contractor's responsibilities, including the following:
 - 1. Provide test specimens representative of proposed products and construction.
 - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
 - 5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
 - 6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, 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 of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.

8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

1.11 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 2. Payment for these services will be made from testing and inspection allowances as authorized by Change Orders.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, 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, whether specified or not, to verify and document that the Work complies with requirements.
 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor will 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 inspection 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 inspection 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. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. 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 inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
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 and submit with each Application for Payment.
1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 2. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Commissioning Authority, 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 and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

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

END OF SECTION

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

- A. Contractor is responsible for temporary utility use charges.
- B. Metering: Contractor comply with Owner requirements for utility metering.
 - 1. Water Service: Pay water-service use charges for water used by all entities for construction operations.
 - 2. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.
 - 3. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- 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- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.

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 TDLR "2012 Texas Accessibility Standards" (TAS).

1.6 PROJECT CONDITIONS

- A. Installation and removal of temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Engage Installer of each permanent utility to assume responsibility for operation, maintenance, and protection of each permanent utility during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Environmental Controls:
 - 1. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
 - 2. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
 - 3. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
 - 4. Mineral-Wool Board Insulation, Type IVB: ASTM C612, Type IVB; unfaced.
 - 5. Temporary Partitions:
 - a. Gypsum Board over non-structural metal framing. Provide airtight enclosure where required for airflow isolation.
 - b. Temporary Partition System including aluminum framed corrugated plastic sheet.
 - 6. Temporary Doors (and Frames): Preservative treated dimension lumber and plywood.
 - 7. Sealant Tape: Compatible with substrate for adhesion to seal joints.
 - 8. Sealant: Compatible with substrate and rated for exposure indicated, to seal penetrations
 - 9. Filter media for protection of mechanical systems: Air filter rolls with tacky surface. MERV 8 rating. UL900 compliant.

2.2 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, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities 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 Section 01 74 19 "Construction Waste Management and Disposal" for disposition of salvaged materials that are designated as Owner's property.

3.2 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.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
1. Existing Utility Interruptions: Comply with Section 01 10 00 "Summary."
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

- F. 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.
- G. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 - 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. 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. Comply with Authorities Having Jurisdiction (AHJ) for fire department access during construction activities.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."
- 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 Elevator Use: Use of elevators is not permitted.
- H. Temporary Use of Permanent Stairs: Use of stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to installed condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

- C. 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 workday.
- D. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by building occupants from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 - 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 5. Protect air-handling equipment.
 - 6. Provide walk-off mats at each entrance through temporary partition.
- E. 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. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with 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.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - 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 and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, 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 single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

1.4 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.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 - 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

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 that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
 - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to 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 in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 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 meeting 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.
- B. Product Selection Procedures:
 1. Sole 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.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole 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.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
 3. Limited List of Products: 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.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
 4. Non-Limited List of Products: 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.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
 5. Limited List of Manufacturers: 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.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
 6. Non-Limited List of Manufacturers: 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.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 7. 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 may additionally 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.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 73 00 - EXECUTION

PART 1 GENERAL

1.1 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. Installation of the Work.
 - 3. Cutting and patching.
 - a. Cutting and patching of existing roof.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.

1.2 DEFINITIONS

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

1.3 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
 - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Preinstallation Meeting for Roofing Repair Work:
 - 1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck and/or air barrier installer if applicable and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment
 - 2. If Owner has contracted with a roofing systems manufacturer for roofing repair work, representative from contracted roofing manufacturer or entity is required to attend this meeting.
 - 3. Review and finalize construction schedule and verify availability of materials, installers' personnel, equipment, and facilities needed to make progress and avoid delays
 - 4. Review methods and procedures related to roofing installation, including manufacturer's written instructions

5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members
6. Review roof slope
7. Review loading limitations of deck during and after roofing
8. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing
9. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable
10. Review temporary protection requirements for roofing system during and after installation
11. Review roof observation and repair procedures after roofing installation
12. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant
13. Review transition from wall air barrier to roof membrane and base flashing if applicable

1.4 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. 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. Use materials that are not considered hazardous.

- C. 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.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.
- D. Tapered Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using hydrocarbon blowing agents which are Montreal Protocol compliant, complying with ASTM C1289, Type II, Class 2, Grade 2:
 - 1. Thickness: As required to provide positive slope. Tapered insulation shall be installed at a minimum slope of 2 times the slope of the roof where the roof structure slopes, unless otherwise noted on the Drawings. Where the roof structure is set flat, provide tapered insulation at a minimum slope of 1/4 inch per foot, unless otherwise noted on the Drawings. Starting thickness 1/2 inches.
 - 2. Positioning: Above existing insulation.
 - 3. Codes and Compliances: Provide polyisocyanurate insulating materials that comply with the following testing standards:
 - a. FM Standard 4450/4470 approval for Class 1 insulated steel, wood, concrete and gypsum roof deck construction.
 - b. UL Standard 1256 Classification, insulated metal deck construction assemblies; Construction #120 & #123.
 - c. UL Standard 790 Classification, Class A with most roof membrane system
- E. Insulation and Coverboard Adhesive: Two-component low-rise polyurethane foam OlyBond500 insulation adhesive as manufactured by OMG Roofing Products. Roofing manufacturer shall verify the compatibility of the adhesive with the insulation.
- F. Coverboard: 1/4-inch-thick glass-faced gypsum roof board. Georgia Pacific DensDeck prime. Verify board with application of membrane (cold adhesive, torch) to board surface

PART 3 EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, 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, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. 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.

3.4 INSTALLATION

- A. 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, unless otherwise indicated on Drawings.

- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. 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 of type expected for Project.
- 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: Select tools or equipment that minimize production of excessive 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 portions of the 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 with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.5 CUTTING AND PATCHING

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

- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 01 10 00 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to 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 and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. 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.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. 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 eliminate 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, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
 - 6. Patching of Existing Concrete Slabs: Where removal or abandonment of existing utilities results in voids in existing concrete, patch concrete with mix design matching existing slab.

- I. Repair of Existing Roof: Remove existing roofing as required to install new HVAC units and equipment curbs and associated work. Provide roofing membrane repairs and flashings per this section and sheet metal work per Section 07 62 00.
 1. Base Flashing Installation at New Roof Curb Penetrations
 - a. Remove existing sheet metal components, ventilation equipment, etc., as may be required by the Work.
 - b. Remove existing plies, base flashing, insulation and/or other roofing components to the extent necessary for installation of new structural and mechanical Work. Remove all debris from the roof surface daily. Do not place debris directly on unprotected finished roof surface. Protect open edges of insulation from water entry at all times. Do not leave insulation edges open to the elements overnight.
 - c. Install new structural repairs, decking, curbs, etc., and secure to structure/deck as required.
 - d. Install new insulation and cant as required.
 - e. Install 1/4-inch-thick coverboard over wood and insulated curbs, cants, roof insulation and any other flammable surface where roofing membrane and/or flashing membranes are torch-applied.
 2. Install modified bituminous membrane base flashing plies over cant strips and other sloping and vertical surfaces and equipment curbs, and secure to substrates according to roofing system manufacturer's written instructions.
 - a. Prime concrete and masonry surfaces and other substrates with asphalt primer if required by roofing system manufacturer.
 - 1) Where membrane base flashing is installed onto the finished field membrane, prepare the granule surface in accordance with manufacturer's instructions. Install the base flashing membrane over the granule surface in accordance with the manufacturer's instructions.
 - b. Base Flashing Application:
 - 1) Torch or set backing sheet in cold adhesive.
 - 2) Flashing sheet torch or set in cold adhesive to backing sheet.
 3. Extend base flashing plies up the wall a minimum of 8 inches above roof membrane and 4 inches onto field of roof membrane.
 4. Mechanically fasten tops of all modified bituminous membrane base flashing securely at terminations and perimeter of roofing.
 - a. Fasten top edge 8 inches o.c. with nails driven or screws driven through minimum 1 inch diameter metal caps.
 - b. Tops of all membrane flashings shall be sealed using flashing cement reinforced with woven glass fiber fabric, immediately following completion of membrane flashings and prior to installation of metal counterflashing.
 - c. All vertical laps of the membrane flashing shall be sealed in accordance with membrane manufacturer's instructions.
 5. At all inside and outside corners of membrane base flashing reinforce the inside and outside corners in accordance with manufacturer's requirements.
 6. Install metal flashings per Section 07 62 00.
 7. Cap Sheet product approved by manufacturer of installed roofing membrane as required to protect intact roofing Warranty.
- J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

- A. 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.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

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

3.8 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. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

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SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous construction waste.
 - 2. Recycling nonhazardous construction waste.
 - 3. Disposing of nonhazardous construction waste.

1.3 DEFINITIONS

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

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 14 days of date established for the Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use form acceptable to Architect and Owner. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.

7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may not serve as Waste Management Coordinator.
- B. Refrigerant Recovery Technician Qualifications: Universal certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
 2. Review requirements for documenting quantities of each type of waste and its disposition.
 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
 - 1. Total quantity of waste.
 - 2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
 - 3. Total cost of disposal (with no waste management).
 - 4. Revenue from salvaged materials.
 - 5. Revenue from recycled materials.
 - 6. Savings in transportation and tipping fees by donating materials.
 - 7. Savings in transportation and tipping fees that are avoided.
 - 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 - 9. Net additional cost or net savings from waste management plan.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the

use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 - 2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
- D. Paint: Seal containers and store by type.

3.4 DISPOSAL OF WASTE

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

END OF SECTION

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 6. Section 01 79 00 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

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

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1.7 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, 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.
 - 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 testing, adjusting, and balancing records.
 6. Submit sustainable design submittals not previously submitted.
 7. 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 01 79 00 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 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 in accordance with Section 01 29 00 "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.
 5. Submit Final Completion photographic documentation.
- 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. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- C. Accessibility Inspection: Owner will engage a Registered Accessibility Specialist to perform accessibility inspection required by TDLR
 1. Coordinate inspection schedule with Owner's Accessibility Specialist
 2. Correct deficiencies identified in accessibility inspection report
 3. Notify Owner when deficiencies have been corrected.

1.9 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, 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.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit by uploading to Newforma Info Exchange
- E. 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.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site 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 not planted, mulched, or 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. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.

- j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils.
 - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 01 73 00 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product 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. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit by uploading to Newforma Info Exchange. Enable reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.
- E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. 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: Bookmark 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.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Authority.
 - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 10. 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.
- 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. 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."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 - 2. 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.
 - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

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

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

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

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
 - 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.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. 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.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; 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.
 - a. 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.
 - 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.
- E. 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.
- F. 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.

- G. 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.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. 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.
- J. 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 maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. 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.

**PACKAGE 2
CONTRACT DOCUMENTS
NOVEMBER 12, 2025**

**KITCHEN EQUIPMENT REPLACEMENT
PROJECT NO. 2512.00**

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 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.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies:
 - a. Submit one PDF set(s) of marked-up record prints.
 - b. Submit one full size printed set of marked-up prints.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
 - 1. Submit one full size printed Project manual including annotated Project Specifications including Addenda, PRs, and ASIs
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

- A. 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: Annotated PDF electronic file.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to Architect for resolution.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Format: Annotated PDF electronic file.
2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

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

1.6 RECORD PRODUCT DATA

- 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. 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.
- C. 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.

1.7 MISCELLANEOUS RECORD SUBMITTALS

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

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for

construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit digital file of video recording 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 Construction Manager.
 - e. Name of Contractor.
 - f. Date of video recording.
 - 2. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 01 78 23 "Operation and Maintenance Data."

1.5 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

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 have been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

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

- g. Instructions on stopping.
- h. Normal shutdown instructions.
- i. Operating procedures for emergencies.
- j. Operating procedures for system, subsystem, or equipment failure.
- k. Seasonal and weekend operating instructions.
- l. Required sequences for electric or electronic systems.
- m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

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

1.9 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.

- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- F. 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.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.
 - 1. Submit video recordings on CD-ROM or thumb drive.
 - 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 on 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 recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. Email address.
- B. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 PRODUCTS

PART 3 EXECUTION

END OF SECTION

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 INFORMATIONAL SUBMITTALS

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

- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.7 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Storage or sale of removed items or materials on-site is not permitted.
- D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.9 COORDINATION

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

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 PREPARATION

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

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

3.4 PROTECTION

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

3.5 SELECTIVE DEMOLITION, GENERAL

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

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

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

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

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

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. Formed low-slope roof sheet metal fabrications.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates if applicable.
 - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following
 - 1. Underlayment materials.
 - 2. Elastomeric sealant.
 - 3. Butyl sealant.
 - 4. Epoxy seam sealer.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details of termination points and assemblies.
 - 6. Include details of roof-penetration flashing.
 - 7. Include details of special conditions.
 - 8. Include details of connections to adjoining work.
 - 9. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

- C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.
- D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- E. Samples for Verification: For each type of exposed finish.
 - 1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 - 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
 - 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
 - 1. Provide certification that sheet metal fabricator is an authorized fabricator in accordance with NRCA's ITS Certification. Provide evidence that the sheet metal edge flashings and copings have been approved and listed by NRCA and Intertek Testing Services (ITS).
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
 - 1. Sealants: Contractor shall provide to sealant manufacturers, samples of all substrates which are in contact with sealant, regardless of whether adhesion must be achieved.
 - a. For substrates which must support adhesion, submit to the Architect, for record only, sealant manufacturer's reports of adhesion tests conducted in accordance with ASTM C794
- C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
- B. Special warranty.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 - 1. Company specializing in sheet metal work with minimum five years of documented experience
- B. Comply with [SCAQMD Rule 1168](#), Adhesive and Sealant Applications, most current amended version:
 - 1. Architectural Sealants: Max VOC Content 250 g/L.
 - 2. Architectural Sealant Primers:
 - a. Non Porous: Max VOC Content 250 g/L.
 - b. Porous: Max VOC Content 775 g/L.
- C. Comply with [SCAQMD Rule 1113](#), Architectural Coatings, most current amended version:

1. Roof Primers, Bituminous: Max VOC Content 350 g/L.
2. Mastic Coatings: Max VOC Content 100 g/L.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; 26 gauge, with smooth, flat surface.
 1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled) or ASTM A480/A480M, No. 2B (bright, cold rolled).

2.3 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
 - 2. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
 - 3. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Sealant: ASTM C920, Type S, Grade NS, Class 25 or higher. Use NT, T, M, G, A and O
 - 1. Basis of Design: Subject to compliance with requirements, provide MasterSeal NP 150 as manufactured by BASF Building Systems, or the following:
 - a. Kemper System; GreatSeal PE 150 Multipurpose Sealant
 - 1) VOC Content: 18.26 g/L.
- E. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.4 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
 - 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.

- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- G. Seams:
 - 1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Pocket Receivers (Framed Construction, Roof Curbs):
 - 1. Material: Galvanized steel.
 - 2. Thickness: 24 gauge
 - 3. Fasteners:
 - a. Corrosion resistant, barbed, annular ring or screw shank nail
 - b. Spacing: 8 inches o.c.
 - 4. Solder all outside and inside corners
- B. Counterflashing (Installed with Stainless Steel Pocket Receiver): Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Stainless Steel: 26 gauge
 - 2. Fasteners:
 - a. Stainless steel screw fasteners
 - b. Spacing: 8 inches o.c.
- C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Galvanized Steel: 24 gauge
 - 2. Fasteners:
 - a. Corrosion resistant screws with neoprene washers
 - b. Spacing: 12 inches o.c.
 - c. Solder all outside and inside corners
- D. Penetration Flashing: Fabricate from the following materials:
 - 1. Galvanized steel: 24 gauge
 - a. Fasteners:
 - 1) Corrosion resistant, barbed, annular ring or screw shank nail
 - 2) Spacing: Staggered 3 inches o.c.
 - 3) Length: Minimum 1 1/4 penetration into nailer

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 5. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 7. Do not field cut sheet metal flashing and trim by torch.
 8. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 1. Coat concealed side of stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
 - d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
 2. Do not solder metallic-coated steel sheet.
 3. Do not pre-tin zinc-tin alloy-coated copper.
 4. Do not use torches for soldering.
 5. Heat surfaces to receive solder, and flow solder into joint.
 - a. Fill joint completely.
 - b. Completely remove flux and spatter from exposed surfaces.
 6. Stainless Steel Soldering:
 - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
 - b. Promptly remove acid-flux residue from metal after tinning and soldering.
 - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- H. Roof Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof.
1. Prepare roof membrane in accordance with manufacturers written instructions.
 2. Coat (prime) roof penetrations all around with M-1 structural sealant to 3 inches above the roof membrane and extend M-1 structural sealant onto the roof membrane all around each penetration.
 3. Prime roof membrane as required by manufacturer. Hold curb flat side up and place a 1/4 inch bead of M-1 structural sealant to the entire bottom perimeter. Apply one additional 1/4 inch bead of M-1 structural sealant down the center of the section. Do not tool beads flat.
 4. Place each curb section down on the roof surface and press down firmly until M-1 structural sealant extrudes from the outside edges. Seal all scarf joints with M-1 structural sealant. Provide a minimum 1- inch distance between roof penetrations and inside edge of curb. Roof penetrations shall have a minimum 1- inch space between penetrations.
 5. Apply a continuous bead of M-1 structural sealant around the outside base of the curb. Tool sealant to a smooth fillet.
 6. Fill curb with pourable sealer that is compatible with roof membrane.

3.3 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.5 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 07 72 00 - ROOF ACCESSORIES

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. Roof Curbs for Equipment Support

1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
- B. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For roof accessories.
 - 1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.
- C. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

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

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 ROOF CURBS FOR EQUIPMENT SUPPORTS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
- B. Basis of Design: Subject to compliance with requirements, provide one of the following:
 - 1. The Pate Co., Model es-2.
 - 2. Roof Products, Inc., Model RPES-3.
 - 3. ThyBar, Model TEMS-3.
- C. Height: Minimum 12 inches measured from top of roof membrane to top of curb unless otherwise noted.
- D. Material: Galvanized steel sheet: ASTM A653 structural quality, Grade 33, G60 hot-dip zinc coating.
- E. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. Provide sloping end sections where required.
 - 3. Construction to match roof pitch.
 - 4. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
 - 5. Insulation: Install 1-1/2-inch- (38-mm-) thick polyisocyanurate board insulation.
 - 6. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 7. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.

2.3 METAL MATERIALS

- A. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.
- B. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.
- C. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened.

Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

- D. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
- E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 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. Install roof accessories according to manufacturer's written instructions.
- B. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
- C. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
- D. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
- E. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- F. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
- G. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

3.3 REPAIR AND CLEANING

- A. Clean off excess sealants.

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

END OF SECTION

SECTION 11 40 00

FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Documents, apply to the Work specified in this Section.

1.2 SUMMARY OF THE WORK

- A. Project Name and Location: Leander ISD Package 2 Equipment Replacement
Rouse HS, Vandegrift HS and Vista Ridge HS
- B. Approval of Working Surface: Any contractor performing work over the work of other contractors shall notify the Architect of any unsatisfactory conditions. The beginning of work by any contractor shall constitute acceptance of the previous work.
- C. Field Verification of All Dimensions: Before ordering any materials or doing any work, field verify all measurements of the building and be responsible for their accuracy. No extras will be allowed for variations from drawings in existing conditions or work performed under this contract. Any discrepancies found shall be submitted to the Architect or Foodservice Design Professionals (FDP) for instructions before proceeding.
- D. Cutting and Patching: No excessive cutting will be permitted, nor shall any structural members be cut without the written approval of the Architect. Each Contractor shall leave all chases and openings straight, true, and of the proper size in their work, as may be necessary for the proper installation of their and other contractors' work. After such work has been installed, the contractor shall carefully fit around, close, repair, patch, and point up the same as directed to the satisfaction of the Architect.
- E. Cooperation: The General Contractor, all other contractors, and all subcontractors shall coordinate their work with all adjacent work and shall cooperate with all other trades to facilitate the general progress of the work. Each trade shall afford all the other trades every reasonable opportunity to install their work and store their material.
- F. Inspection and Tests: The architect, Owner, Foodservice Design Professionals (FDP), and their representative shall always have access to the work, whether in preparation or progress. Provide proper and safe facilities for such access and inspection.
- G. Fees, Permits, and Inspections: Secure and pay fees for all permits, licenses, and inspections as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, codes, rules, regulations, and contract requirements bearing on the work.

1.3 SCOPE OF WORK

- A. Include the Work specified, shown, or inferable as part of Food Service Equipment. Portions of this Work may be subcontracted to those qualified to do such work as necessary because of jurisdictional trade agreements and restrictions.
- B. The General Contractor is responsible for Related Work specified in other Sections: i.e., final plumbing, electrical and mechanical connections. The Kitchen Equipment Contractor (KEC) is responsible for all internal connections.

- C. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up, and equipment adjustment in this contract. Plans and specifications shall be considered mutually explanatory. Work required by one, but not by the other, shall be performed as though required by both. Items required by one but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings so that all equipment items shall be entirely functional for the purpose for which they were designed and intended. Provide all necessary material, tools, equipment, and labor required for the complete delivery, un-crating, erection, and installation as designated on the food service equipment plan and, in the specifications, to be made ready for final connection by the appropriate Division contractors. When there is any discrepancy between drawings and specifications, bidders should seek clarification of any discrepancies from the Architect and or Foodservice Design Professionals (FDP) before bidding.
- D. Should the drawings disagree in themselves or the specifications with the drawings (*and clarification was not sought before bidding*), the higher cost, better quality, more stringent, and greater quantity of the work or materials shall be completed without additional costs to the Owner.

1.4 OTHER DIVISIONS/CONTRACTORS RELATED WORK

A. Division 03 (Concrete) is responsible for but not limited to:

- 1. Slab depressions reinforced concrete wearing bed at prefabricated walk-in assemblies.
- 2. Concrete or masonry platforms (with a finished top and coved base at the perimeter) for the raised setting of food service equipment.
- 3. Slab depressions to receive stainless steel drain trench liner/grate assemblies (provided under this Section).

B. Division 09 (Finishes) responsible for but not limited to:

- 1. Interior finished floor with a coved base at prefabricated walk-in assemblies.

C. Division 10 (Specialties) responsible for but not limited to:

- 1. S/S Corner Guards throughout the kitchen (unless specified otherwise).
- 2. Lockers.

D. Division 22 (Plumbing) is responsible for but not limited to:

- 1. All connections shall be made in accordance with local codes and national standards, except where plans and specifications exceed those codes and standards.
- 2. Empty PVC and wide-sweep bends for refrigerant piping to beverage lines, Co2 lines, and remote food service equipment refrigeration systems.
- 3. Rough-in and final connection of plumbing systems to food service equipment and between components (including materials and labor). Accessories provided loose with food service equipment by Section 11 40 00 to be field installed by Division 22. This includes but is not limited to the installation of all faucets (water fill faucets, pre-rinse faucets, etc.), hoses, gas disconnects and drains from the equipment point of connection to building plumbing systems. All drain lines are provided and installed by Div. 22.

- a. Kitchen Equipment Contractor is responsible for providing all faucets (water fill faucets, pre-rinse faucets, etc.), drain fittings, mixing valves, control valves, water pressure regulators, vacuum breakers, and all accessories for equipment specified under 11 40 00. Division 22 is responsible for installation.
4. Indirect drain line runs from the equipment to the nearest drain or floor sink—lines to be type 'K' Copper.
5. If any plumbing accessories or fittings are provided loose with equipment by 11 40 00, Div. 22 is to attach to equipment and provide final connection.
6. Gas Supply Systems with all components and fittings required for a complete system.
7. Water Supply Systems with all components and fittings required for a complete system.
8. Compressed Air Systems with all components and fittings required for a complete system (if required for this project).
9. Piping and Drainage Systems (Sanitary and Grease-laden). ***Systems must be cleaned and flushed before the final connection with food service equipment - Critical.***
10. Floor Sinks (Provide and Install). Flange and grates to be flush with the finished floor.
11. Floor Drains (Provide and Install). Flange and grates to be flush with the finished floor.
12. Trench Drains (Provide and Install). Trench Liners provided by 11 40 00. Flange and liners to be flush with the finished floor.
13. Grease Traps as required (Size, Provide, Locate, and Install). Verify with local codes to bypass or pipe through Grease Trap and/or Interceptor.
14. P-Traps as required (including all disposers).
15. Interconnect water through Water Filter (Filter provided by 11 40 00 unless otherwise specified) to equipment.
16. Gas Quick Disconnect Installation (Quick Disconnect provided by 11 40 00).
17. Safety Restraint Cable Installation (Safety Restraint Cable Provided by 11 40 00).
18. Specified couplings and piping to all equipment furnished by 11 40 00.
19. Air Compressors (if required for this project) (Size, Provide, and Install unless otherwise specified).
20. Water Softeners (if required for this project) (Size, Provide, and Install unless otherwise specified).
21. Pressure Boilers (if required for this project) (Size, Provide, and Install unless otherwise specified).
22. Hand Sinks (Provide (unless otherwise specified) and Install). Provide a hot water tempering valve if required. Water temperature to be at least 100 degrees and flow for at least 20 seconds.
23. Ice Bin Drain Insulation (if Ice Machine is provided in this project) (Provide and Install).

24. Unions at disposer solenoid valves (if Disposer is provided in this project) (Provide and Install).
25. Back Flow Prevention as required (Provide and Install - including all disposers). Back-Siphonage shall be installed at all fixtures and equipment where backflow and/or back-siphonage may occur and where a minimum air gap cannot be provided between the water to the fixture or equipment at its flood/level rim. When furnished with equipment, vacuum breakers shall override the above if acceptable with applicable codes. Division 22 is responsible for verifying requirements with local codes.
26. Janitor Sink with Faucet (Provide and Install).
27. Freeze Proof Hydrant at the exterior of the building by receiving door (Provide and Install - unless otherwise specified).
28. Reverse Osmosis Systems (Size, Provide (unless otherwise specified), Locate, and Install).
29. All piping within the counter body or under fabricated counters must be run to a connection point below the counter body by Section 11 40 00—final connection by Division 22.
30. Exhaust Hood condensate drain connections (if Exhaust Hood is provided in this project) (Provide and Install).
31. Interconnection of ½" CW to Pre-Rinse and Disposers cone/body inlets piped through the solenoid and vacuum breaker (if Disposer is provided in this project).
32. Fire System Piping. The exposed piping is to be chrome plated.
33. Pipe ½" cold water to swirl inlets at disposers (if Disposer is provided in this project).
34. Water Treatment for Ice Builders (Non-Chlorinated water with a PH Level of 10 or Higher) and any drains and overflows. Piping from Ice Builders to Tumble Chillers by Div. 23 (if Ice Builders and Tumble Chillers are provided in this project).
35. Refer to Section 2.2 PLUMBING / MECHANICAL REQUIREMENTS for additional information.

E. Division 23 (Mechanical) responsible for but not limited to:

1. All connections shall be made following local codes and national standards, except where plans and specifications exceed those codes and standards.
2. Empty EMT Conduit with pull-wire and wide-sweep bends for refrigerant piping to remote food service equipment refrigeration systems.
3. Rough-in and final connection of mechanical systems to food service equipment, walk-in assemblies, and between components (including materials and labor).
4. A mechanical contractor will test and balance rooms and exhaust hoods. **Balance report for food service Exhaust Hoods to be provided to Foodservice Design Professionals (FDP) immediately upon completion (send to Houston.Submittal@fdp.org) and must be submitted with O&M manuals.**

5. Exhaust Hoods, Condensate Hoods, Fire Suppression Systems, connections, and controls (Provide and Install – unless otherwise specified). Provide tempered air at all supply ducts.
 - a. If Exhaust/Condensate Hoods and Fire Suppression Systems are specified under Section 11 40 00, Division 23 is responsible for all Exhaust and Condensate Hood connections (Provide and Install).
6. VFD System and controllers when required by code (Provide and Install).
7. Provide and install all ventilation (direct or indirect), air conditioning, and heating systems (unless otherwise specified).
8. Coordinate Supply and Return ducts above Serving Counters. No cold air is to blow directly on hot food counters or open-air refrigerated merchandisers.
9. Coordinate Supply and Return ducts away from equipment with top-mounted refrigeration. No cold air is to blow directly on compressors.
10. Mechanical Contractor to locate temperature monitors within return ducts.
11. Circulating air above walk-in assemblies (Provide and Install).
12. Circulating air above and in air gaps at warehouse cold storage assemblies (Provide and Install).
13. Water Chillers as required (if equipment is provided in this project) (Provide, Size, and Locate).
14. Piping from Ice Builders to Tumble Chillers (if equipment is provided in this project) (Size, Provide and Install).
15. Refer to Section 2.2 PLUMBING / MECHANICAL REQUIREMENTS for additional information.

F. Division 26 (Electrical) responsible for but not limited to:

1. Rough-in and final connection of electrical systems to food service equipment, walk-in assemblies, and between components (including materials and labor). Accessories provided loose with food service equipment by Section 11 40 00 to be field installed by Division 26.
2. Empty EMT Conduit with pull-wire and wide-sweep bends for refrigerant piping to remote food service equipment refrigeration systems.
3. Empty EMT Conduit with pull-wire and wide-sweep bends for interconnect cables between LAN and POS terminals, change-makers, pre-check units, printers, CPUs, etc. Division 26 to verify where the conduit will run for POS System (i.e., Manager's Office or IDF Room).
4. Empty EMT Conduit with pull-wire and wide-sweep bends for fire suppression systems. Interconnect the Fire Protection System to panel box shunt trips and building alarm.
5. Walk-in Assembly Light Fixture Installation (Provided loose by Section 11 40 00) (if Walk-in is provided in this project).

6. Table Limit Switch (Provided loose by Section 11 40 00) (if Dishmachine is provided in this project) – Install and interconnect to Dishmachine.
7. Electrical Materials and Devices (Shunt-trip breakers, surge protectors, lighting control devices, conduit, wire, etc.).
8. Switches and Stainless Steel Disconnects as required (Provide, Locate, and Install – to be in an accessible location).
9. Charging Stations for Forklifts, Pallet Stackers, and Pallet Jacks (Size, Provide, Locate, and Install) (if equipment is provided in this project).
10. Interconnection between Condensate Fan and Dishmachine control panel (if equipment is provided in this project).
11. Interconnection between Exhaust Hood fans and switch (if equipment is provided in this project).
12. Interconnection between Exhaust Hood lights and switch (if equipment is provided in this project).
13. Door Heaters, Lights, Coils, and Heated Pressure Relief Ports pre-wired to the junction box at the top of walk-in assemblies (if equipment is provided in this project) provided by Section 11 40 00—final connection by Div. 26.
14. If any electrical accessories, fittings, and cord/plugs are provided loose with equipment by 11 40 00, Div. 26 is to attach to equipment and provide final connection.
15. Provide waterproof receptacles in wet areas.
16. All electrical connections beneath Exhaust Hoods (if equipment is provided in this project) to extend to shunt trip breakers with electrical panel box for shutdown during fire mode.
17. Receptacles will be pre-wired to Junction Box or Load Center for final connection by Division 26.
18. All electrical lighting, power, and distribution systems.
19. Do not interconnect more than three (3) convenience outlets on one (1) breaker.
20. Other than convenience outlets, all electrical connections on food service plans are dedicated breakers.
21. Doorbell at receiving door (Provide and Install –audible throughout Kitchen, Office, and Dry Storage room).
22. Adequate lighting at receiving door.
23. (if Walk-in is provided in this project) Walk-in Manufacturer is to provide Two (2) Edwards 860 Series (or equal) red lens, surface-mounted Xenon Emergency Strobe Beacons. Walk-in manufacturer will install One (1) located in the Kitchen above Walk-In Freezer door (or Cooler door when Freezer is within Cooler in an 'inline' assembly), and provide the second unit loose for installation by Division 26 located in the Cafetorium (Division 26 to coordinate location with Owners and Architect). Division 26 is to provide all conduit and wiring required and interconnect the illuminated Push Button

Panic Alarm in the Walk-In Freezer to both Strobe Beacons (**Critical**). Coordinate with Division 27.

24. Dedicated circuit for heated drain line connection in Walk-In Freezer (120/1/16.0 Amp) at each coil (if Walk-In is provided in this project).
25. GFCI Breaker for all receptacles under Exhaust Hoods (if Hoods are provided in this project) and Holding Cabinets (if Holding Cabinets are provided in this project), to be located within Kitchen's electrical Breaker Panel and not at the receptacles.
26. Remote GFCI reset switches to be accessible to end user.
27. All electrical below Exhaust Hoods (if Hoods are provided in the project) are to have Shunt Trip Breakers.
28. Interconnect Temp Sensor to Exhaust / Supply fans (if Hoods are provided in this project).
29. Electrical contractor to provide conduit with pulled wires prior to installation of equipment.
30. Refer to Section 2.5, ELECTRICAL REQUIREMENTS, for additional information.

G. Division 27 (Communication) responsible for but not limited to:

1. Data line coordination for food service equipment.
2. Time clocks as required.
3. Video cameras for learning assistance in food service areas as required (Provide, Locate, and Install).
4. (if Walk-in is provided in this project) (Provide conduit, data line, and interconnect the illuminated Push Button Panic Alarm inside the Walk-In Freezer to the Building Automation System (BAS). When activated, facility personnel are to be notified - coordinate notification requirements with the Owner (**Critical**). Coordinate with Division 26.

H. Division 28 (Electronic Safety and Security) is responsible for but not limited to:

1. Security Cameras as required (Provide, Locate, and Install).

I. General Contractor responsible for but not limited to:

1. Any wall penetration required for food service equipment utilities. Escutcheon plates or S/S sleeves are to be provided and installed as needed.
2. Bulk Freezer Ventilation Pipe (if Bulk Freezer is provided in this project) (Provide and Install unless otherwise specified).
3. Core drilling for Guide Rails (if Guide Rails are provided in this project).
4. Refrigeration Roof Curbs / Roof Jack (if Refrigeration System is provided in this project and located on the roof).
5. Interior Bollards (if required for this project) – to be epoxy painted per local codes (Provide and Install).

6. Furnish and Install ¾" Plywood blocking in the wall for mounting equipment furnished by Section 11 40 00 as required.
7. Walk-in Depressions (to be dead level) and sand leveling bed (if Walk-in is provided in this project and recess is shown).
8. Structural bracing for Bulk Walk-in Assembly ceiling panels if required.
9. Menu System Video Monitors in Servery (unless otherwise specified).
10. Structural bracing for Menu System Video Monitors if required.
11. Interior/Exterior refrigeration penetrations and sleeves at building penetrations.
12. DoorScope viewer (peephole) with wide viewing angle at receiving door.
13. Canopy at receiving door. Coordinate height with the height of Receiving Door (8') and the mounting height of Air Screen above the door.
14. Soap and towel dispenser provided by Owner. G.C. is responsible for installation.
15. Washer and Dryer (Provide and Install, unless otherwise specified).
16. Dwarf wall at exposed front/ends of cafeteria serving counters with the finish as selected by the Architect (if required in this project).
17. Substrate (Provide and Install) at SS Wall Caps for pony walls.
18. Final cleaning of all equipment before demonstrations.

1.5 QUALITY ASSURANCE

- A. In addition to complying with all applicable laws, statutes, building codes, and regulations of public authorities, comply with the following:
 1. National Sanitation Foundation (all equipment to bear label)
 2. National Electric Code
 3. Underwriters' Laboratories, Inc. (all applicable equipment to bear label)
 4. American Gas Association Laboratories
 5. National Fire Protection Association
 6. Americans with Disabilities Act
 7. Food and Drug Administration HACCP Guidelines
 8. International Energy Conservation Code (IECC)
 9. Department of Energy
 10. Environmental Protection Agency
 11. CSA Group

- B. Furnish certification of regularly manufactured equipment listing or classification by Underwriters Laboratories, Inc., with the initial submittal.
- C. Furnish a list of equipment and components (internal and external) that are not of domestic origin. All equipment and components (internal and external) should be of domestic origin when possible. This information should be provided with the initial submittal.
- D. Projects outside the continental United States shall adhere to all local authorities having jurisdiction over that project.

1.6 SUBSTITUTIONS

- A. **The specified equipment items or components are intended to be the basis of the bid. All other brands, including any additional names, which may be listed as "Alternates" or "Approved Equal," must conform with the general and item specifications, warranties, size/dimensions, quality, accessories, function, voltage, horsepower, etc. of the first-named brand and be subject to Paragraph C-03 of this Article.**
- B. Proposed Substitutions:
 - 1. Submitted at least 14 calendar days before Bid Date.
 - 2. Submit proposed substitutions with catalog data and manufacturer's shop details indicating all modifications required to conform with the specified brand.
 - 3. List of deviations must include equipment name, model number, accessories, and features with deviation(s) noted for specified and proposed alternate equipment. Equipment without listed deviation(s) will be considered furnished as specified.
- C. Substitutions with prior approval:
 - 1. Submitted on Bidder's letterhead attached to Proposal Form with individual additive/deductive amounts stipulated and the documentation required in Paragraph B-02.
 - 2. Owner reserves the right to accept or reject any or all substitution proposals before execution of the Contract.
 - 3. Provide all design/engineering services required to adjust in space, systems, utilities, etc., and pay all additional costs of utilities, construction, or professional services that may be incurred due to the acceptance of any substitution.
- D. All appliances or other equipment within a common group or category (e.g., refrigerators, kettles, ovens, shelving, etc.) must be from the same manufacturer.

1.7 INTERPRETATION OF DOCUMENTS

- A. During Bidding: Bidder's, supplier's, or vendor's questions and comments about Construction Document's clarity or intent will be addressed by addendum.
- B. After Award:
 - 1. Clarification Bulletin will confirm Construction Document requirements.
 - 2. Request for Information submitted by Contractor shall contain Contractor's proposed resolution.

1.8 WARRANTY

- A. Provide a written warranty for parts and labor for one year **from the date of Substantial Completion**, including an extended four-year replacement warranty on compressor bodies.
- B. Components of equipment subject to replacement before one year's use (such as refrigerator door gaskets) and those items which may fail due to improper or inadequate periodic maintenance by the Owner/Operator (such as an uncleaned refrigeration system condenser) are not intended to be included within the scope of the Warranty.
- C. Refrigeration Systems/Equipment: One-year free service available within twenty-four hours of notification.
- D. Furnish three copies of a list of all equipment and their respective local service agencies, indicating the address, telephone number, and name of the person to contact. The service agencies selected shall be factory-authorized for the equipment assigned whenever possible.
- E. Provide the following for refrigeration systems/equipment unless specified otherwise:
 - 1. One (1) year of free refrigeration system service is available within twenty-four hours of notification.
 - 2. Provide five (5) year manufacturer's registered written replacement warranty certificate covering compressor bodies. Warranty to cover labor costs for the first year.
 - 3. Provide ten (10) years of the manufacturer's registered written replacement/repair warranty certificate covering walk-in assembly panels. Warranty to cover defects in material and workmanship. Warranty to cover labor costs for the first year.
 - 4. Provide two (2) year parts and labor warranty for **all parts/components (including third-party components that may be utilized) (including freon)**, walk-in cooler(s), and freezer(s) not otherwise covered herein.
- F. **All above-stated warranty periods are from the date of Substantial Completion**. All replacement parts due to a warranty call should be the same quality as the original, or better if the original were defective. Replacement parts should be of domestic origin where possible.

1.9 SUBMITTAL DATA

- A. **All submittals must be received, reviewed, and approved as noted prior to equipment procurement. If any equipment is procured prior to this process, it is on the KEC to replace any equipment, accessories, or other components that may not meet the specifications or design intent for the facility, including all costs associated with rectifying the errors made in procuring the equipment before this critical process.**
- B. Special Requirements: The following are in addition to any general requirements given elsewhere in the Documents.
- C. Submittal Requirements:
 - 1. Kitchen Equipment Contractor to furnish all submittals via PDF, drawings to be scaled per General Specifications and provided in Three (3) submittal packages.
 - 2. Foodservice Design Professionals requires the below-listed business days for each package submitted. Packages are to be submitted within 14 days between each issued package. Each package should contain individual submittal sets.

- a. Package One to include (2) Individual sets: 10 Business Days for Review
 - i. Equipment rough-in
 - ii. Equipment Brochure
- b. Package Two to include (3) Individual sets: 10 Business Days for Review
 - i. Exhaust Hoods
 - ii. Walk-in Cold Storage Assemblies
 - iii. Refrigeration
- c. Package Three to include (4) Individual sets: 15 Business Days for Review
 - i. Custom Fabrication
 - ii. Serving Counters
 - iii. Merchandising Equipment
 - iv. Miscellaneous Submittals
- D. Submittals to be identified with the below-listed file name structure:
 - 1. 11 40 00-1 EQUIPMENT BROCHURE
 - 2. 11 40 00-2 EQUIPMENT ROUGH-IN PLANS
 - 3. 11 40 00-3 CUSTOM FABRICATION
 - 4. 11 40 00-4 SERVING COUNTER
 - 5. 11 40 00-5 EXHAUST HOODS
 - 6. 11 40 00-6 WALK-IN COLD STORAGE ASSEMBLY
 - 7. 11 40 00-7 REFRIGERATION
 - 8. 11 40 00-8 BEVERAGE MERCHANDISER
- E. Package One (1) requires both submittals: Brochure and Rough-in plans. **If not sent together, the submittal will be rejected.**
- F. Foodservice Design Professionals (FDP) will notate all submittals in RED. Architects and General contractors will be notated in color per their direction.
- G. If hard copy submittals are required, Kitchen Equipment Contractor will furnish all copies to the specified trades as required.
- H. If discrepancies, missing information, or incorrect information occur within the documents, Kitchen Equipment Contractor is to seek clarification or note the need for further direction on submittals. The Kitchen Equipment Contractor is to bid the higher of the discrepancies. *Refer to Section 1.3 SCOPE OF WORK: Subsection D.*
- I. Brochure Format (for regularly manufactured equipment and components):

1. Front and rear protective cover with labeled project name.
 2. Brochure index: Indicate Functional Area/Room number, item number, quantity, description, and manufacturer.
 3. A separate flysheet for each component or item of equipment, indicating item number, name, quantity, manufacturer, optional equipment, modifications, special instructions, and utility requirements. Any equipment or assembly containing more than one buyout sub-assembly or component shall have the second item listed in parenthesis beside the primary item name—for example, Serving Counter (hot food well).
 4. Catalog specification sheet with all options notated on the specification sheet and manufacturer's drawing.
- J. Shop Drawings (Rough-In Drawings):
1. Separate drawing sheets: same size as Contract Drawings (Contract Drawings are not to be traced or reproduced). Submittal drawings are to be provided by Kitchen Equipment Contractor and not copied or reproduced from Contract Documents. Any reproduced submittal drawings will be rejected.
 2. 1/4" scale drawing of fixed/movable food service equipment and prefabricated Walk-in assemblies with itemized schedules.
 3. Special Conditions Drawings, sizing, and locating the following conditions:
 - a. Slab depressions, cores, sleeves, or block-outs (walk-in assemblies, drain trenches, piping, etc.).
 - b. Concrete or masonry platforms.
 - c. Pipe sleeves or roof jacks.
 - d. Wall openings or block-outs for pass-through equipment, recessed control panels, in-wall fire-protection system components, etc.
 - e. Blocking grounds or anchor plates required in walls for equipment support/attachment.
 - f. Above-ceiling hanger assemblies for support of exhaust hoods, ceiling-mounted pot racks, etc.
 - g. Access panels in walls or ceiling for service of equipment.
 - h. Ceiling pockets or recesses for unusually high equipment.
 - i. In-wall carriers for wall-hung or cantilevered equipment.
 4. Electrical Rough-In Drawing
 5. Plumbing and Mechanical Rough-In Drawing
 6. Required information:
 - a. All fixed and portable food service equipment shown on Contract Drawings.
 - b. All prefabricated Walk-In Assemblies and Conveyor/Dishtable Assemblies shown on Contract Drawings.

- c. All general-use and convenience utilities or services indicated on Contract Drawings, including those required by or connected to equipment or devices, not in this Section.
 - d. All Rough-In Drawings: Fully dimensioned from engineering benchmark (column lines, when provided) and finished-room surface to the point of stub-up through floor and stub-out through wall or ceiling for all mechanical, electrical, and plumbing services.
 - e. Connection number/tag system and symbols: Identical to Contract Drawings.
- K. Shop Drawings (Manufacturer's and Fabricator's):
- 1. Sheet Size: Identical to Contract Drawings, drawn or plotted at a 1/4" scale for plan view, 1/2" for elevations, and 1 1/2" for sections and construction details.
 - 2. Included information: The item number, name, and quantity.
 - 3. Construction details, sections, and elevations to reflect the requirements of the Specifications and Drawings.
 - 4. Indicate adjacent walls, columns, and equipment.
 - 5. Indicate plumbing and electrical schematic drawings for equipment such as conveyors, waste systems, self-cleaning exhaust hoods, exhaust hood fire protection systems, and fabricated fixtures with a single electrical or plumbing connection.
 - 6. Mechanical or electrical operating components or products integrated into a fabricated fixture: ventilation and service access required or recommended by the manufacturer, including panel size and location to permit easy lubrication, adjustment, or replacement of all moving parts.
- L. All equipment and engineering rough-in plans sheet numbers are to match the contract documents. All equipment item numbers and engineer item numbers located on the schedules are to match the contract documents. All engineering requirements must be updated to accommodate the provided equipment and match the contract documents. The Kitchen Contractor coordinates any MEP revisions to accommodate the supplied and proposed equipment. The Kitchen Equipment Contractor is responsible for any costs associated with equipment substitution.
- M. Foodservice Design Professionals (FDP) drawings and schedules are not to be copied in any way. Any replicated drawings of Foodservice Design Professionals (FDP) will be rejected.

1.10 SERVICE MANUAL

- A. Three copies bound in 1 1/2" hardback, three-ring binders (as many volumes as required by the scope of the project) with the same data as the brochure after installation (Refer to "Submittal Data"). Provide separate service manuals for each independent area within the project scope (Main Kitchen, Culinary, Concession, etc.).
- B. Each Volume: Section for maintenance of finish materials (e.g., stainless steel, plastic laminates, FRP, Plexiglas, etc.).
- C. Catalog specification sheet and/or manufacturer's shop drawings, including wiring diagrams when applicable.

- D. Each Volume: Index of items, manufacturer's operating/maintenance information, replacement parts data, list of all product warranties, and price lists. Provide the name, title, and address of personnel at each respective manufacturer and service personnel to be contacted for spare/replacement parts and service after the warranty period.
- E. To the greatest extent possible, provide two copies of the manufacturer's instructional video cassettes for operating, maintenance, and equipment service.
- F. Internally subdivide binder contents with permanent page dividers, logically organized by equipment item number or manufacturer name, with tab titling printed under reinforced, laminated plastic tabs.
- G. Electronically submitted manuals must follow the formatting requirements listed above.
- H. **Service Manual to be provided to the owner before kitchen equipment demonstration.**

1.11 VERIFICATION AND COORDINATION OF PROJECT / DATA

- A. Utilities Rough-in Drawings and field verifications are to be completed within four weeks after receipt of notice-to-proceed. Review Contract Drawings and Submittal Data for accuracy and completeness and notify Architect of conflicts and proposed adjustments. Coordinate work with other sub-contractors.
 - 1. KEC to provide on-site field verification of all underground utilities before pouring concrete for capacity and location and coordinate with General Contractor. Submit a review to Architect and General Contractor. If rough-ins need to be relocated, KEC will compensate other trades for the required relocation.
 - 2. KEC to provide on-site field verification of all other utility connections and locations and coordinate with General Contractor. Submit a review to Architect and General Contractor.
- B. On-Site Inspection Reports
 - 1. Before concrete pour: The Kitchen Equipment Contractor is to submit a copy of the report below to the Architect, General Contractor, and Foodservice Design Professionals (FDP) within 24 hours of the inspection. The form to be submitted is contained within these General Specifications.
 - 2. Before delivery of equipment: The Kitchen Equipment Contractor is to submit a copy of the report below to the Architect, General Contractor, and Foodservice Design Professionals (FDP) within 24 hours of the inspection. The form to be submitted is contained within these General Specifications.



On - Site Inspection Report
Prior to Concrete Pour

Inspection Date _____ Project Name _____

Project Location _____

Inspector's Name _____ Company _____

Inspector's Contact Number _____ Email _____

Architectural Firm _____ Project Architect _____

Architect's Contact Number _____ Email _____

General Contractor _____ Project Manager _____

G.C. Contact Number _____ Email _____

Food Service Consultant Foodservice Design Professionals, LLC Project Manager _____

Contact Number 281.350.2323 Email _____

An on-site inspection to verify the location of UNDERGROUND utilities was conducted on this date. The following conditions were observed and brought to the attention of the General Contractor. (KEC is to provide a written description and copy of the Utility Plan indicating the corrective action required).

1. What difficulties were encountered?

Inspector's Initials _____

This Inspection Report is the responsibility of the Kitchen Equipment Supplier
and the General Contractor. Coordination between the two parties is mandatory.

Neither the Architect nor FDP need to be present at these inspections.

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE
ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN
PROFESSIONALS, LLC.



CSA INSTALLATION APPROVAL REPORT

Report Date _____ Project Name _____

KEC Firm _____ Phone Number _____

Contact Name _____ Email _____

☐ Walk-In panels are installed square, plumb, and level. Inspected prior to interior concrete pour.

☐ Ceiling panels are installed flush and tight to wall panels with undamaged gasket material. Any signs of condensation at joints or walls should be reported to FDP and addressed immediately. Caulk at panel seams will not be an acceptable solution.

☐ All cam-locks are engaged, and buttonholes are in place.

☐ Gaps under the screed or floor angle (due to shimming) are entirely sealed to the slab.

☐ Penetrations in the ceiling or wall panels are insulated and sealed.

☐ Weatherproofing / thermal barrier material is installed.

☐ All sharp edges of metal doors and diamond treadplate are clean of sharp edges and deburred.

☐ Door bumper or wall protection is installed and located as to prevent damage of door to adjacent walls.

☐ Cove base installed at all wall bases internal and external of walk-in.

☐ Door systems are correctly installed, and the door is self-closing and seals around the opening perimeter and at the floor threshold. Threshold has a smooth and level transition.

☐ Upon completion of the electrical connections, confirm the final operation of the IC/IC+ control, door heaters and light switches.

☐ Entrapment hardware and alarm systems are installed and functioning.

KEC SIGNATURE _____

COMMENTS _____

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE
ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN
PROFESSIONALS, LLC.



FOODSERVICE DESIGN PROFESSIONALS

On - Site Inspection Report
Prior to Delivery of Equipment

Inspection Date _____ Project Name _____

Project Location _____

Inspector's Name _____ Company _____

Inspector's Contact Number _____ Email _____

Architectural Firm _____ Project Architect _____

Architect's Contact Number _____ Email _____

General Contractor _____ Project Manager _____

G.C. Contact Number _____ Email _____

Food Service Consultant Foodservice Design Professionals, LLC Project Manager _____

Contact Number 281.350.2323 Email _____

An on-site Inspection to verify the location of INSTALLED utilities was conducted on this date. The following conditions were observed and brought to the attention of the General Contractor. (KEC is to provide a written description and copy of the Utility Plan indicating the corrective action required).

1. What difficulties were encountered?

Inspector's Initials _____

This Inspection Report is the responsibility of the Kitchen Equipment Supplier
and the General Contractor. Coordination between the two parties is mandatory.
Neither the Architect nor FDP need to be present at these inspections.

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE
ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN
PROFESSIONALS, LLC.

- C. Review critical systems/components for application, performance, and capacity and submit calculation worksheets with the initial submission of brochure/rough-in drawings, with all proposed adjustments noted, including:
1. Exhaust hood removal/supply air volume, velocity, static pressure, duct collar sizes, and locations.
 2. Refrigeration Systems (compressor, condenser, and evaporator) capacities/sizes, quantities, and refrigerant piping distances/sizes.
 3. Exhaust Hood Fire Suppression Systems (nozzle locations, air handler, fuel interlocks, piping/distance limitations).
 4. Locations of Vacuum Breakers.
 5. Conformance of Refrigerated Components/Equipment with HACCP Guidelines (e.g., salad/sandwich pans, upright/open refrigerator cabinets, salad bars) with HACCP Guidelines.
 6. Gas and water line sizes and manifold configurations.
 7. Diameter and length of flexible connector lines for fixed/movable gas appliances.
 8. Fabricated Equipment load center panels (individual and total amperage calculations and circuit balance).
 9. ADA compliance of workstations, service positions, passageways, etc.
- D. Ceiling mounted appliances/fixtures: Verify and coordinate dimensions/location of support framing/hangers with the General Contractor—all material and installation below 12'-0" AFF: Section 11 40 00.
- E. Dimension Responsibility: Obtain actual or guaranteed measurements for the proper equipment fit. All dimensions indicated in Contract Documents are approximate and are as accurate as can be determined at the time. Field-check all horizontal/vertical measurements and conditions at the building before fabrication or delivery of equipment and notify the Architect of all conflicts or deviations from the dimensions shown.
- F. Checking Dimensions at Site: Before ordering any materials or doing any work, verify all measurements of the building and be responsible for their correctness. No extras will be allowed for variations from drawings in existing conditions or work performed under this contract. Any discrepancies found shall be submitted to the Architect for instructions before proceeding.
- G. Scheduling to Fit Openings: Should it become necessary to schedule the construction of walls or partitions before delivery of fixed equipment, the equipment must be fabricated for passage through finished openings. Maintain close contact with the project and be cognizant of all conditions, including vertical handling limitations within the building (elevator cabs or openings, stairs, etc.) and possible hoisting requirements. Coordinate all procedures with General Contractor and Project Team.
- H. Refrigerated and Dry Storage Areas: Verify and coordinate dimensions to accommodate scheduled modular shelf sections. Notify Architect of the variance between the Contract Documents and actual conditions.

- I. Color/Pattern Selections: Submit selection samples of solid polymer products, plastic laminate, paint or stain finishes, and vinyl-coated surface material of equipment as selected by the Owner.
- J. Movable Equipment Interface: Rolling stock (pan racks, carts, dollies, dish/tray/rack dispensers) required to fit through or into fixed equipment (roll-in refrigerators, counter bodies, etc.) is to be reviewed and coordinated for compatibility at the time initial of shop drawing submittal. Indicate conflicts and proposed adjustments.
- K. Relocation of Work: Relocate or re-route work as required to coordinate related items free of charge if no extra work is involved.
- L. **Kitchen Equipment Contractor must provide FDP with the food service equipment lump sum pricing (including material and labor) after the contract has been executed and before submittals are provided to FDP. This information is critical to FDP for accounting/billing purposes.**

1.12 EQUIPMENT FURNISHED / INSTALLED BY OTHERS

- A. Obtain and coordinate utility requirements of Owner-Furnished/Owner-Installed (OF/OI) equipment with the building utilities and rough-in drawings/provisions.
- B. Coordinate physical data of OF/OI appliances or equipment and incorporate information into Submittal Drawings. Vendor- or Purveyor-Furnished equipment (e.g., coffee/tea equipment): same as OF/OI.

1.13 WORK INSTALLED BUT FURNISHED BY OTHERS

- A. Coordinate delivery/installation schedule of Owner-Furnished/Contractor-Installed (OF/CI) equipment with the Owner at least ninety (90) days before equipment requirement.
- B. Obtain and coordinate utility requirements of OF/CI equipment with the building utilities and rough-in drawings/provisions.
- C. Receive at the job site and fully incorporate into installation procedures as if furnished under this Section.

PART 2 - PRODUCTS

2.1 FABRICATED FIXTURES MATERIAL / COMPONENTS

- A. Stainless steel sheets or shapes: 18-8, Type 302, polished to 180 grit No. 4 finish.
 - 1. Stainless steel joints and seams: Heli-arc welded, free of pits and flaws, ground smooth, and polished to a No. 4 finish.
 - 2. The "grain" direction of horizontal stainless-steel surfaces: Longitudinal, including the backsplash. The polishing procedure at right-angle corners of fixtures shall provide a mitered appearance.
- B. Galvanized Iron Sheets: Armco copper bearing Zinc Grip or Zinc Grip/Paint Grip.
 - 1. Galvanized iron joints and seams: Arc-welded, free of pits, flaws, and ground smooth.

2. Galvanized sheets or shapes: Washed with mineral spirits and painted with Rust-Oleum gray semi-gloss enamel.
- C. Sound Deadening: Schnee Butyl Sealant ½" wide rope positioned continuously between all frame members or contact material and underside of stainless-steel surface (sinks, tabletops, food wells, over shelves, and undershelves). Tighten stud bolts for maximum compression of sealant and trim excess.
- D. Plastic Laminates: Color/pattern selected by Architect, in 1/16" thickness for flat surfaces: 1/32" thickness for radiused surfaces. Plastic laminates and adhesives must be NSF-approved (Standard No. 35).
- E. Solid Polymer products: Color/pattern/material selected by Architect in thickness as specified. Solid Polymers and adhesives must be N.S.F. approved (Standard No. 51).
- F. Casters:
 1. Fabricated fixtures with "Open Base" construction: Jarvis and Jarvis Model No. 5-405-113P-NSF swivel casters with grease seals on forks and wheels; Zerk fitting in swivel; two casters: Model No. E-75 Verti-Lock brakes. All casters: B-7" rolling bumpers with stainless steel top discs.
- G. Cutting Boards: 1/2" thick Read Products, Inc. "Richlite" cutting board, size as indicated.
- H. Identification Plates, Labels, Tags:
 1. Prohibited Information: Names of suppliers, fabricators, and contractors.
 2. NSF Labels: Required on all pieces of equipment.
 3. Required Information: Function or purpose of controls such as display light switches, food warmer controls, etc.
 4. Plate Construction: Engraved phenolic plastic, secured to equipment with epoxy cement or stainless-steel screws. Furnish samples.

2.2 PLUMBING / MECHANICAL REQUIREMENTS

- A. Plumbing Fittings and Components: Furnished under this Section as follows:

Note: Fitting and components described in Items 1, 2, 3, 4, and 5 are furnished loose by 11 40 00 for final installation and connection by Division 22.

1. Control valves and appliance pressure regulators for water, gas, steam, and vacuum breakers: wherever required on food service equipment (chrome-plated where exposed).
2. Faucets and drains with and without connected overflows (unless otherwise indicated) for all sinks.
3. Specialty food service water-fill faucets, hose bibbs, or hose assemblies indicated in drawings/specifications.
4. Wade Model No. W-10 Shock-Stop shock absorbers for all food service equipment with quick-opening or solenoid-operated water valves.

5. Dormont Series Water Quick Disconnect hose, diameter per water connection size requirements, with safety fitting, w/coiled restraining device, full port ball valve, antimicrobial coating, lifetime warranty.
 6. Extensions of indirect waste fittings to open-sight floor sink or floor drains from sinks, under bar equipment, and food-holding components of serving counters (e.g., cold pans, hot food wells, refrigerator/freezer coils not equipped with condensate evaporators) furnished and installed by Division 22. Drains: All drains to be type 'K' Copper – Paint with aluminum paint where exposed. **Div. 22 to ensure a minimum air gap of 1" and not less than twice the effective opening of the indirect waste pipe, per code. Div. 22 to ensure all drain lines are centered over floor sink grate openings and no water splashes on the floor.**
 7. Piping brackets and supports beneath fabricated equipment.
 8. Closed Base Bodies: Removable 18-gauge stainless steel closure panel at plumbing penetrations under the top.
 9. Control valves on Open Base fixtures: Mounted on a 14-gauge stainless steel gusset-shaped panel with h 3½" setback from the countertop edge/rim to the face of the control handle.
 10. Fill hose/faucet at support pedestals or Closed Base Body: Installed in a 15" x 18" x 5" deep recessed mounting panel. Panel bottom: sloped on a 60° angle, with 3/8" stainless steel rod hanger-bracket for the hose.
 11. Provide filtration option as shown on contract documents (a, b, c, or combination thereof):
 - a. In-line Water Filter System:
 - i. Everpure System filters for coffee/tea brewers, icemakers, water chillers, convection steamers, and beverage systems. They should be sized per the manufacturer's recommendation.
 - b. Remote Central Water Filter System.
 - c. Remote and/or In-line Reverse Osmosis system.
- B. Final Plumbing Connections Provisions:
1. Fabricated equipment containing components, fittings, and devices indicated on food service connection drawings to be connected to the building systems: each component, fitting, or group thereof pre-piped to a utility compartment for final connection by Division 22. Refer to drawings for capacities.
 2. Field-assembled equipment (e.g., prefabricated walk-in assemblies, exhaust hoods, ware wash machines, convection ovens, etc.): plumbing components completely interconnected under this Section for final connection arrangements indicated on Utility Connection Drawings.
 3. All plumbing final connection points of equipment shall be tagged, indicating the following:
 - a. Item number
 - b. Name of devices or components

c. Type of utility (water, gas, steam, drain, chilled water)

- C. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Sub Sections E. Plumbing and F. Mechanical for additional information.

2.3 FOOD SERVICE EQUIPMENT REFRIGERATION SYSTEMS

- A. Install complete with all refrigerants, oil, dials, dehydrators, gauges, and controls required for the system's proper operation.
- B. Self-contained or factory-installed compressors: Check and adjust to the proper operating temperature prescribed by FDA/HACCP.

2.4 PLUMBING TRIM

- A. Faucets: Furnished for all sinks or equipment requiring open water supply.
- B. Fill Faucets: Furnished for appliances requiring open water supply.
- C. Drain Fittings: Furnished for all sinks or equipment requiring removal of liquids. Install specified chrome-plated or stainless-steel fittings in die-stamped openings with washers and locknuts. The solder may be used as a sealer but shall not be applied to the top surface of the drain fittings.

2.5 ELECTRICAL REQUIREMENTS

- A. All electrical systems, components, and accessories within the work of this Section: Certified to be in accordance with NEC 70.
- B. Electrical Fittings and Components: Furnished under this Section as follows. Coordinate food service equipment loads, voltage, and phase with the building system and confirm any existing or OF/OI equipment requirements.
- C. Cord and Caps:
1. Coordinate all food service equipment cord/caps with related receptacles.
 2. All 120, 120/208, and 208 volts "plug-in" equipment shall have Type SO or SJO cord and plug with ground wire fastened to the frame/body of the item.
 3. Cord lengths for fixed equipment: Adjusted to eliminate loose-hanging excess.
 4. All non-fixed plug-in "buy-out" equipment: Hubbell configuration and ratings as required.
 5. All mobile electrical support equipment (heated cabinets, dish carts, etc.) and counter appliances mounted on mobile stands (mixers, food cutters, toasters, coffee makers, microwave ovens, etc.): 8'-0" cord length with cord-hanger strap secured to the rear of equipment or mobile stand.
- D. Switches and Controls:
1. Each motor-driven appliance or electrically heated unit: Equipped with a control switch or starter per Underwriters' Laboratories, Inc., with low-voltage and overload protection.
 2. Disposer controls recess-mounted in the wall: External fittings and accessories removed from the enclosure and furnished with 12-gauge stainless steel perimeter

angle flange with welded corners. Install control at 4'-0" AFF to the bottom of the enclosure.

3. Disposer controls recess-mounted in counter-splash risers: External fittings and accessories removed from NEMA 4 enclosure and furnished with 12-gauge stainless steel perimeter angle flange with welded corners. Install control at 3'-0" AFF to the bottom of the enclosure. Provide the panel with a 60" long Seal-Tite electrical conduit from the bottom of the control panel for final field connections under Division 26.
4. Equipment that is not provided with built-in circuit breakers or fused terminal block and is indicated on Utility Connections Drawings to be directly connected to the building electrical system: a NEMA 4 stainless steel disconnect switch furnished and installed by Division 26.
5. All remote manual starters, disconnect switches, magnetic contactors or starters, and push-button stations: NEMA Type 4 enclosure; NEMA Type 1 enclosure only when installed in a Closed Base Body.

E. Heating Elements:

1. Electrically heated equipment: Thermostatic controls.
2. Water heating equipment: Equipped with positive low water shut-off.

F. Receptacles and Switches:

1. Receptacles installed in vertical panels of support pedestals or Closed Base Bodies: installed in 12" x 8½" x 3" deep recessed mounting panel sloped at a 60° angle and turned up to the top of the opening.
2. Pre-wire receptacles in closed base fixtures to a junction box installed within 6" from the bottom of utility or compressor compartments.
3. Receptacles mounted on Open Base fixtures: Installed on a 12" x 10½" x 4½" deep 14-gauge stainless steel panel with returned ends and sloping recess—secure panel to the underframe of fixture top.
4. Pre-wire receptacles on open base fixtures to a junction box secured to a leg or mounted on the underside of the lower shelf. Vertical runs of wiring: Made in rigid conduit or within the tubular leg.
5. Receptacles installed in/on-fabricated equipment: Hubbell, Inc. assemblies horizontally mounted in a metal box with stainless steel cover plate.
6. Switches installed in/on-fabricated equipment: Hubbell, Inc. with metal box and stainless-steel cover plate. Switches: pre-wired to the controlled device and a junction box installed within 6" from the bottom of the utility or compressor compartment. All refrigeration system switches: Installed within the compressor compartment near the door opening.
7. Load centers installed in/on fabricated equipment to have all fixture components pre-wired to the load center with balanced phase loading. Load center: Ready for final connection by Division 26 and flush-mounted within the utility compartment rear panel, set back 8" from the access door. All breaker/device information will be typewritten on the circuit schedule in the load center door (number corresponding breaker/device) with an enclosed schematic wiring diagram of fixture components.

8. All receptacles are to be pre-wired to the cord and plug assembly and routed through the over-shelf post at all island equipment locations unless specified otherwise.

G. Light Fixtures:

1. Light fixtures with lamps installed in/on fabricated or field-assembled equipment: pre-wired to a junction box for final connection (continuous-run fixtures when indicated).
2. LED Display Light: Install light fixtures full-length of Display Stand and Serving Shelf with stud bolts and pre-wire through support posts to an apron-mounted switch.
3. Heat Lamps: Installed to the underside of serving shelf assemblies. When multiple 24" heat lamps are specified, provide maximum length heat lamp chassis. Install all switches remotely from lamps.
4. **Walk-in assembly LED Light Fixtures: Furnished by Section 11 40 00, final installation by Div. 26. All electrical wiring and conduit, provided by Div. 26, electrically connected through the Vapor Proof light fixture base connection, located on the interior door header—all Conduit to be Seal-tight conduit. Door frame wiring stubs out the top of panels 8" in flexible conduit for final connection by the electrical contractor. All horizontal conduits: below ceiling panels. All lighting fixtures will be wired from inside the assembly—no penetrations through the ceiling panels. Seal-sleeved penetrations are airtight at both sides of the panel. KEC is responsible for verifying that trade contractors seal all penetrations.**

H. Final Electrical Connection Provisions:

1. Fabricated equipment containing electrically operated components or fittings indicated on Utility Connections Drawings: Direct connected, with each component, fitting, or group pre-wired to a junction box for final connection by Division 26. Refer to drawings for circuit loading.
2. Fabricated equipment containing electrically operated components and devices indicated: Circuit-breaker load center with each component or device pre-wired to a separate circuit breaker for balanced phase loading and single final connection by Division 26.
3. Field-assembled equipment (e.g., prefabricated walk-in assemblies, exhaust hoods, ware wash machines, etc.) shall have electrical components completely interconnected in this Section for final connection arrangements as indicated on Utility Connection Drawings by Division 26.
4. Pre-wire the following groups of walk-in assembly electrical devices to a top-mounted junction box for final connection by Division 26 per compartment grouping (unless otherwise indicated).
 - a. Light fixtures and switches; heated pressure-relief ports.
 - b. Door/jamb heaters.
 - c. Evaporator fans, defrost elements and drain line heaters.
5. All electrical final connection points of equipment shall be tagged, indicating the following:
 - a. Item number.

- b. Name of devices on the circuit.
- c. Total electrical load.
- d. Voltage and phase.
- I. Lamps: in all food service equipment containing light fixtures. Refrigerator or heated cabinets: All exposed LED lamps above or within a food zone: Shat-R-Shield lamps or standard lamps, sleeved with end caps.
- J. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Subsection F. Division 26 (Electrical) for additional information.

2.6 PRE-APPROVED KITCHEN EQUIPMENT CONTRACTORS

- A. Only the following named Subcontractors and those approved later, if any, are approved for inclusion in the Contractor's Bid.
- B. **Any contractor requesting inclusion within this bid must submit AIA form 305 a minimum of 14 days before the bid date for review or as required by Architect.**
 - 1. Stafford Smith, Mr. JP Garcia, 7129 North Loop East, Houston, TX 77028, Phone: 713.892.5001, Email: jpgarcia@staffordsmith.com
 - 2. Texas Metal Equipment Company, Mr. Travis Andrews, 23518 Coons Road, Tomball, Texas 77375, Phone: 713.466.8722, Email: tandrews@tmeco.com
 - 3. Kirby Restaurant Supply, Mr. Brian Kernan, 809 S. Eastman Road, Longview, Texas 75602, Phone: 903.757.2723, Email: briank@kirbysupply.com
 - 4. Mission Restaurant Supply, Mr. Robert Snoddy, 1126 S. St. Mary's Street, San Antonio, Texas 78210, Phone: 832.970.4020, Email: roberts@missionrs.com
 - 5. Kommercial Kitchens, Mr. Terry Woodard, 13544 East Fwy., Houston, TX 77015, Phone: 409.769.1199, Email: terry@kommercialkitchens.com
 - 6. Supreme Fixtures Co., Inc., Mr. Tim Hampel, 11900 Vinny Ridge Road, P.O. Box 193655, Little Rock, AR 72219, Phone: 501.455.2552, Email: tim@supremefixture.com
 - 7. Amundsen Commercial Kitchens, Mr. Lewis Beville, 105 Montie, Longview, TX 75604, Phone: 903.576.6354, E-mail: lewis@afeok.com

PART 3 - EXECUTION

3.1 DELIVERY AND INSTALLATION

- A. Supervision: Provide a skilled and proficient foreman or supervisor who shall remain on the job during the entire installation.
- B. Delivery: Coordinate with the progress of construction and Owner's operation schedules. Unless otherwise instructed and documented by Owner or General Contractor, the following procedures apply:
 - 1. Field-assembled fixed equipment integrated into the structure (e.g., walk-in assemblies, exhaust hoods, drain trench/grate assemblies, conveyor systems, ceiling-mounted

- utensil racks) are to be sent to the job site when directed by the General Contractor and installed or protected accordingly.
2. All other Fixed Equipment: delivered after completion of work on adjacent finished ceilings, lighting, finished floor, wall systems (including painting), and painted gas lines.
 3. Major Movable Equipment: delivered, when possible, to inventory in a secured area for interim job-site storage or, if the secured area is unavailable when fixed equipment installation/clean-up has been completed.
 4. Minor appliances and loose items (e.g., pans, covers, flatware containers, etc.) should be delivered only when the Owner is prepared to receive and inventory such items.
- C. Installation: performed by the manufacturer of custom fabricated fixtures.
1. Assemble, square, level, and ready all items for the final utility connections.
 2. Cut neatly around obstructions to provide sanitary conditions.
 3. Where gaps of $\frac{1}{4}$ " or less occur adjacent to or between equipment, insert rope backing and smoothly apply General Electric construction sealant Series SE-1200 silicone mastic (clear color). Mask both sides of the gap for neat sealant application and remove excess. If space exceeds $\frac{1}{4}$ ", neatly install 18-gauge stainless steel trim molding of proper shape with concealed attachment. Use epoxy cement or "Z" clips wherever possible to secure stainless steel trim. Exposed edges or corners of trim: eased and smooth.
 4. Refrigeration coil drain line runs to an indirect drain connection greater than 2" from the face of the wall or panel: Either of the following field procedures:
 - a. Trench the floor and provide a 6" wide x 2" deep 16-gauge stainless steel sloping (-1" to -2") trough from the face of the cooler/freezer wall to the body of the floor sink/floor drain. Trough: turned up 4" at the wall; $\frac{3}{4}$ " flange with $\frac{1}{2}$ " turndown at both long sides. Set trough in waterproof mastic and seal 1" OD drain tube penetration into floor sink/floor drain at -2 $\frac{1}{2}$ " BFF. Patch the floor to match adjacent material/surface.
 - b. Provide 12" x 6" x 2" deep 16-gauge stainless steel condensate pan mounted to cooler/freezer wall at 6" AFF clear. Trench the floor and install a 1" OD drain line from the bottom of the pan to the body of the floor sink/drain. Slope drain line $\frac{1}{4}$ " per foot and seal all connections watertight. Patch the floor to match adjacent material/surface.
- D. Protection of Work:
1. Fabricated fixtures: Fiberboard or plywood taped to tops and exposed body panels/components.
 2. Manufactured Equipment: Fiberboard or plywood taped as required by equipment shape and installation-access requirements.
 3. Prohibited use of equipment: Tool and materials storage, workbench, scaffold, stacking area, etc.
 4. Damaged Equipment: Immediately documented and submitted to the Owner with the Contractor's recommendation of action for repair or replacement and its impact on the Project Schedule and Contract Amount, if any.

3.2 CLEAN AND ADJUST

- A. Clean up and remove all debris from this Work from the job site as the installation progresses.
- B. Lubricate and adjust drawer slides, hinges, and casters.
- C. Adjust pressure regulating valves, timed-delay relays, thermostatic controls, temperature sensors, exhaust hood grilles, etc.
- D. Clean or replace faucet aerators and line strainers.
- E. Touch-up damage to painted finishes.
- F. Start up and check the operation of all refrigeration systems for at least 72 hours before acceptance.

3.3 EQUIPMENT START-UP/DEMONSTRATION

- A. Carefully test, adjust, and regulate all equipment following the manufacturer's instructions and certify in writing to the Owner that the installation, adjustments, and performance are in full compliance.
- B. Provide the Owner or food service Operators with a thorough operational demonstration of all equipment and furnish instructions for general and specific care and maintenance. Coordinate and schedule selected equipment items and attendees with the Owner at least two weeks before the demonstration starts.

3.4 FINAL OBSERVATION

- A. Final observation will be made when the Contractor certifies that they have completed their work, thoroughly reviewed the installation/operation of each item in the contract and found it to comply with the Construction Documents.
- B. Repetitive final observations (more than two) and all costs associated with it which may be incurred due to the Contractor's failure to comply with the requirements of this Article will be invoiced to this Contractor on a \$70.00/hr and expense basis.

PART 4 - EQUIPMENT SCHEDULE

- 4.1 REGULARLY MANUFACTURED EQUIPMENT/COMPONENTS:** Standard finishes and accessories unless specifically deleted or superseded by the Contract Documents.
- 4.2 FABRICATED AND FIELD-ASSEMBLED EQUIPMENT:** Arrangement and configuration as shown on Plans, Elevations, Detail Drawings, and outlined in Specifications.
- 4.3 REFER TO DRAWINGS:** For unit quantities and plumbing, electrical or mechanical provisions are required, including the manufacturer's optional voltages, wattages, burner capacities, etc.
- 4.4 REFER TO PART 2 – PRODUCTS:** For accessories, fittings, requirements, and procedures related to the listed buy-out and fabricated equipment.
- 4.5 ALTERNATE MANUFACTURER REQUIREMENTS:** A specific product manufactured by the listed pre-approved equals shown under Section 4.7 Food Service Equipment are acceptable only if the specific product can evidence compliance with the specified line items and the contract documents (Refer to Section 1.6; Sub-Section A.).
- 4.6 RE-USED EXISTING EQUIPMENT IF PROVIDED IN THIS PROJECT**
- A. Existing equipment scheduled for re-use is to be inventoried and documented that equipment is in operating condition once Kitchen Contractor has taken ownership.
 - B. Provide pictures of all equipment once inventoried and issue them to the architect to ensure that equipment has not been damaged.
 - C. Verify the locations of all equipment with the owner.
 - D. Existing equipment that is to be reused may need parts or accessories for proper and complete operation. Submit a report listing all items with pricing for approval to allow complete installation.
 - E. Utility disconnection and re-connection: Under Divisions 22 and 26. Kitchen Contractor to verify utility requirements of existing equipment and coordinate with Foodservice Design Professionals (FDP) as required. If utilities shown on FDP drawings do not match the requirements of existing equipment – KEC is to relay that to FDP immediately. All utilities not scheduled for re-use must be capped and covered by required disciplines.
 - F. Disassembly, removal, transportation, and relocation: under this Section and scheduled with General Contractor. The owner's representative must be present and coordinate the date/time with the owner.
 - G. Thoroughly clean inside and out before relocation.
 - H. Review functional parts (e.g., doors, controls, heating elements, compressors, etc.) and submit a report of required repairs and cost estimates. Any finishes or equipment damaged due to construction will be repaired as required.
 - I. Existing equipment not scheduled for reuse is to be carefully removed/relocated by the Kitchen Contractor per the Owner's direction. Kitchen Contractor to coordinate the date/time with General Contractor and Owner.
 - J. Removal or replacement of existing equipment is to be scheduled for times of least interruption and inconvenience to the food service operation. Submit the proposed time frame schedule, task sequence, and process for approval before starting work.

- K. Kitchen Contractor to verify size and shape for all existing re-used equipment and coordinate with Foodservice Design Professionals (FDP) as required.
- L. Any modification(s) required/desired for re-used existing equipment to be verified by the Kitchen Contractor. Before the changes are made, all modifications must be approved by the Owner and Foodservice Design Professionals (FDP).
- M. The KEC is to verify and coordinate all the utility requirements with the construction documents as required. Refer to the general specifications regarding conflicts.

4.7 FOOD SERVICE EQUIPMENT

- A. All equipment is to have a performance check from factory-authorized personnel. Warranties will begin on the day of the performance check.
- B. All equipment and internal components should be of domestic origin where possible.
- C. Architect to verify/coordinate the finishes below:
 - 1. Walls: Ceramic Tile, Flat FRP, or Molded FRP (Smooth, Impervious, and easily cleanable as approved by local jurisdiction)
 - 2. Ceilings: Removable Vinyl Face Tile (Smooth, impervious, and easily cleanable as approved by local jurisdiction)
 - 3. Floors: Tile, Epoxy, or Rubberized flooring system (Smooth, impervious, easily cleanable and slip resistant as approved by local jurisdiction) (Coordinate floor tile transition at serving lines)
 - 4. Floors: Walk-in Assembly – Extend kitchen floor flush into Walk-in assembly with coved base
 - 5. Furr Downs above Serving Counters

ROUSE HIGH SCHOOL

ITEM NO. 109.1	ICE MAKER WITH BIN	QUANTITY 1
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Manufacturer:	Manitowoc
Model:	IYF1800C/CVDF1000/F-1300SG
Size and Shape:	Refer to drawings
Alternate:	Scotsman, Hoshizaki, Follett

- 1. Stainless steel bin.
- 2. Stainless steel legs.
- 3. Provide bin adapter kit as required.
- 4. Provide Luminice II Virus and Bacteria Inhibitor.
- 5. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to Ice Machine.
- 6. One (1) pre-filter and water filter sized to manufacturers recommendations. Provide two (2) sets of replacement filters. Mount on wall adjacent to ice machine in an easily accessible location.
- 7. Coordinate cord and cap with receptacle. Water supply to filter to be hard copper plumbed. 60" long flex hose from filter to ice maker. Interconnection thru water filter to ice machine and final connection by Division 22. Water filter overflow tube to be strapped to back side of ice machine and extend to 1" above floor sink.
- 8. Remote condenser to be 208 volt single phase. To be located in same spot as existing unit. Provide 2" insulation on refrigerant lines to and from ice maker. Provide all tubing as required for a complete system
- 9. Provide scope, paddle and holding racks for both
- 10. Coordinate installation with ceiling grids, adjust as required

END OF ROUSE HIGH SCHOOL

VISTA RIDGE HIGH SCHOOL

ITEM NO. 109.1

ICE MAKER WITH BIN

QUANTITY 1

Manufacturer:	Manitowoc
Model:	IYF1800C/CVDF1000/F-1300SG
Size and Shape:	Refer to drawings
Alternate:	Scotsman, Hoshizaki, Follett

1. Stainless steel bin.
2. Stainless steel legs.
3. Provide bin adapter kit as required.
4. Provide Luminice II Virus and Bacteria Inhibitor.
5. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to Ice Machine.
6. One (1) pre-filter and water filter sized to manufacturers recommendations. Provide two (2) sets of replacement filters. Mount on wall adjacent to ice machine in an easily accessible location.
7. Coordinate cord and cap with receptacle. Water supply to filter to be hard copper plumbed. 60" long flex hose from filter to ice maker. Interconnection thru water filter to ice machine and final connection by Division 22. Water filter overflow tube to be strapped to back side of ice machine and extend to 1" above floor sink.
8. Remote condenser to be 208 volt single phase. To be located in same spot as existing unit. Provide 2" insulation on refrigerant lines to and from ice maker. Provide all tubing as required for a complete system
9. Provide scope, paddle and holding racks for both
10. Coordinate installation with ceiling grids, adjust as required

END OF VISTA RIDGE HIGH SCHOOL

VANDEGRIFT HIGH SCHOOL

ITEM NO. 109.1

ICE MAKER WITH BIN

QUANTITY 1

Manufacturer:	Manitowoc
Model:	IYF1800C/CVDF1000/F-1300SG
Size and Shape:	Refer to drawings
Alternate:	Scotsman, Hoshizaki, Follett

1. Stainless steel bin.
2. Stainless steel legs.
3. Provide bin adapter kit as required.
4. Provide Luminice II Virus and Bacteria Inhibitor.
5. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to Ice Machine.
6. One (1) pre-filter and water filter sized to manufacturers recommendations. Provide two (2) sets of replacement filters. Mount on wall adjacent to ice machine in an easily accessible location.
7. Coordinate cord and cap with receptacle. Water supply to filter to be hard copper plumbed. 60" long flex hose from filter to ice maker. Interconnection thru water filter to ice machine and final connection by Division 22. Water filter overflow tube to be strapped to back side of ice machine and extend to 1" above floor sink.
8. Remote condenser to be 208 volt single phase. To be located in same spot as existing unit. Provide 2" insulation on refrigerant lines to and from ice maker. Provide all tubing as required for a complete system
9. Provide scope, paddle and holding racks for both
10. Coordinate installation with ceiling grids, adjust as required

END OF VANDEGRIFT HIGH SCHOOL

END OF SECTION 11 40 00

SECTION 21 00 01 - BASIC FIRE PROTECTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Basic Fire Protection Requirements specifically applicable to Division 21 sections, in addition to Division 1 - General Requirements.

1.2 REFERENCES

- A. All references in Division 21 to codes, standards or other publications shall be the latest edition / version, unless noted otherwise.
- B. International Fire Code
- C. NFPA 13 – Standard for the Installation of Sprinkler Systems.
- D. NFPA 14 – Standard for the Installation of Standpipe and Hose Systems.
- E. NFPA 20 – Standard for the Installation of Stationary Pumps for Fire Protection.
- F. NFPA 24 – Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
- G. NFPA 25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- H. NFPA 70 – National Electrical Code.
- I. NFPA 72 – Fire Alarm and Signaling Code.
- J. NFPA 101 – Life Safety Code
- K. NFPA 241 – Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- L. UL – Fire Equipment Directory.
- M. UL 199 – Automatic Sprinklers.

1.3 PLANS

- A. These specifications are accompanied by plans indicating typical layouts, pipe and equipment location, etc. The plans and these specifications are complimentary each to the other and what is called for by one shall be as binding as if called for by both. Should there be a conflict between Drawings and specifications regarding a material shown or work described or detailed then the material of work having the greater value shall be provided.
- B. The plans as prepared are in general diagrammatic. The Contractor shall carefully lay out his work at the site to conform to the architectural, mechanical, electrical and structural conditions to provide grading of piping, to avoid all obstructions and to conform to details of installation as shown on the plans and supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated satisfactorily operating installation. The General Contractor must

coordinate the work of all trades. All necessary offsets in piping, fittings, ductwork, etc. required to avoid interferences between piping, equipment, structural and architectural work are not shown but shall be furnished and installed by the contractor without additional expense to the Owner.

- C. This project contains several different type of ceiling finishes, ceiling heights, elevation changes, high volumes, etc. The contractor shall coordinate all pipe routing to keep piping concealed above ceilings wherever possible. Where fire protection piping will be exposed in spaces with no ceilings, the piping shall be routed as high and close to structure as possible. The exact routing and location of exposed piping shall be reviewed by and acceptable to the Architect and Engineer. Exposed elevation change is not acceptable and shall be subject to removal, at the contractor's expense, unless coordinated with the A/E. The contractor shall carefully coordinate pipe routing and sprinkler head locations with all trades.
- D. These specifications and plans accompanying same are intended to cover systems which will not interfere with the design of the building, which will fit into the available spaces, and which will insure complete and satisfactory systems. Each contractor shall, therefore, carefully examine the plans and the building and shall be responsible for the proper fitting of his material and apparatus into the building.
- E. Contractor's attention is directed that all equipment he proposes to furnish shall fit into the spaces allocated for same on the plans. It shall be the Contractor's responsibility to furnish data to evidence that sufficient space can be provided for the installation of proposed equipment and that adequate access will exist for servicing and maintenance of equipment. Should changes become necessary during construction, the contractor shall make such necessary changes at his (the Contractor's) own expense.
- F. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention no later than five (5) days prior to the bid date. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus or equipment.

1.4 CHANGES

- A. Any changes from the plans necessary to make this work conform to the building as it is constructed, to make this work fit the work of other trades or to make this work conform to the rules of city and municipal bodies having jurisdiction shall be made by this contractor at no additional cost to the Owner. However, no changes shall be made from the work described on the plans and these specifications except on written order from the Architect.
- B. If any changes are required other than those mentioned above and the changes involve extra work on the part of the contractor, no charges for this extra work shall be allowed unless authorized in advance of the work by a written order from the Owner and/or Architect stating the charges to be made for the work.
- C. Proposed use of item or equipment other than that specified or indicated may require redesign of structure, partitions, foundations, piping, wiring, or other parts of mechanical, electrical, or architectural layout. Redesign, new drawings, and detailing required shall be prepared and submitted to Architect/Engineer for approval.
- D. Where approved deviation requires different quantity, size and arrangement of wiring, conduit, equipment, etc. from that specified or indicated, provide such items and all other additional equipment required by system at not additional cost to the Owner.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protection:

1. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation.
2. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
3. Damaged equipment or material shall be replaced with new as determined and directed by the Architect or Engineer. In particular, piping insulation which becomes saturated will be rejected and must be removed from the job site. Such repair or replacement shall be at no additional cost to the Owner.
4. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
5. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

B. Cleanliness of Piping and Equipment Systems:

1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. Clean interior of all tanks prior to delivery for beneficial use by the Owner.
4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.6 SUBSTITUTIONS

- A. The materials, products and equipment described and specified establish a standard of quality, function, dimension and appearance to be met by any proposed substitutions.
- B. Reference Division 01 – Product Requirements.

1.7 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. The Contractor shall furnish copies of the manufacturer's literature and Drawings describing all proposed equipment and materials indicated in the specifications. The proposed use of the exact equipment and materials specified shall not change this requirement of including literature describing the proposed equipment. Manufactured items proposed for use, whether specified or proposed for substitution, shall be the current, catalogued product of the manufacturer, and replacement parts shall be available.
- C. Manufacturer's regular catalog sheets will not be acceptable under this requirement unless they indicate completely all of the specification requirements and submittal page labeling criteria stated above. Where drawings cover several sizes or types of construction, they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submitted item with its respective specified item.

- D. Brochures shall contain a certification that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described and that approval is recommended. The certification shall be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required actions. Any deviation from the requirements of the specifications shall be clearly noted and marked for the Engineer's consideration.
- E. Approval of the brochures, or any part of the contents therein, shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called in writing to proposed deviations at the time of transmittal of the brochures and such deviations have been approved, nor shall it eliminate the requirements or the responsibilities, if there are errors of any sort in the data submitted.
- F. Detailed coordination drawings showing proposed fire protection piping layout as well as HVAC ducts and diffusers, HVAC piping, plumbing piping, electrical conduit, light fixtures and other ceiling elements must be submitted for approval prior to proceeding with any installation.
- G. Contractor shall submit a copy of all permits and all inspection results from local authorities as well as result dates and notes from all test performed on the fire protection systems.

1.8 INTERFERENCES AND COOPERATION

- A. The plans are generally diagrammatic and the Contractor shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work will be avoided. Not all offsets in piping, ductwork, etc., are shown. The Contractor shall cooperate with the General Contractor and all other contractors to coordinate their work to avoid interferences and delays and arrange all parts of the work to harmonize in service and appearance with all other parts.
- B. The General Contractor shall coordinate the work of all trades. The various systems to be installed shall follow the normal, common sense priority of systems installation with the highest system to lowest system installation as follows:
 - 1. HVAC ductwork shall be installed up and against building (floor/roof) structural members.
 - 2. Sanitary waste and storm drainage piping system shall begin horizontal routing as high as possible between structural members.
 - 3. Electrical conduit shall be installed up, and against building structure, running parallel with HVAC ductwork and offsetting up into structural bay (void) or below HVAC ductwork to obtain a change in direction or branch take-off.
 - 4. HVAC heating and chilled water supply and return piping, domestic hot and cold water supply and hot water circulating return piping, and medical gas piping shall be installed beside and below the HVAC ductwork and electrical conduit.
 - 5. Fire sprinkler piping system shall be installed below all other systems and components. The fire sprinkler piping shall not conflict with the installation or removal of ceiling system components or tile. The fire sprinkler system piping layout and installation shall be coordinated by the fire sprinkler contractor and the General Contractor with all other trades performing work in the affected area, to avoid conflict with the installation or removal of any other systems components, or to prevent ready access to valves, equipment of the other trades. Do not install sprinkler piping until ductwork mains are in place.
- C. Provide an overhead coordination submittal per Division 01. The submittal shall include all structural, plumbing, mechanical, electrical, and fire protection components.

1.9 MATERIALS AND WORKMANSHIP

- A. All materials shall be new, of the quality specified and free of any defects. Manufacturer's names are listed to establish a standard of quality and construction.
- B. The Contractor will be responsible for transportation of his materials to the job and for their storage and protection until the final acceptance of the job.
- C. Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds and all labor required for the safe and expeditious execution of his contract.

1.10 PERMITS AND INSPECTIONS

- A. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid for by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, state and municipal regulations and other authorities who may have lawful jurisdiction over the work being done. One (1) copy of all permits obtained under this contract and all inspections performed and/or certificates of acceptances, approval or beneficial occupancy received for this work, shall be forwarded to the Engineer.
- B. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling progress inspections through the General Contractor to allow for the following inspections to be performed without impeding the progress of construction. Generally, the Contractor shall plan for inspections to occur two (2) weeks prior to the scheduled concealment of work in the area of inspection.

1.11 EXAMINATION OF SITE

- A. All Contractors submitting proposals for this work shall first examine the site and all conditions thereon and therein. All proposals shall take into consideration conditions as may affect the work under this contract. They shall satisfy themselves as to existing grades and the actual formation, and soil conditions.
- B. Contractors shall verify all service locations, depths, sizes, etc. No information given on the plans shall relieve the Contractor of this responsibility.
- C. Before starting work, the Contractor shall verify all associated existing systems, pipe sizes, locations, and dimensions so that the new systems can be properly connected as indicated on the documents.

1.12 QUALITY ASSURANCE

- A. Perform Work in accordance with the codes listed on the drawings, the local authority having jurisdiction, the Owner's Insurance carrier and the Architect/Engineer. As the minimum standard for the level of quality, in all cases the greater quantity or better quality shall be the first consideration for the basis of an acceptable product or process. The local authority having jurisdiction, the Architect and the Engineer shall have the final authority on the approval and/or use of any product or process specified or submitted for substitution. The greater quality and/or value specified herein for the system(s) and various components and installation procedures shall

take precedence over the minimum requirements of the herein before mentioned codes or that of NFPA 13, NFPA 14 or NFPA 24 in all instances.

- B. Equipment and Components: Bear UL and FM label or marking.
- C. Welding Materials and Procedures: Perform to ASME Code.
- D. Valves: Bear UL/FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Piping: All piping installed on this project shall bear the complete ASTM and Manufacturer's marking. Labeling and identification requirements as required by ASTM. All installed piping 3'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed, to meet this requirement.
- F. All materials shall be new, undamaged, and free of rust. Protect installed piping, valves and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc.
 - 1. Rusted fittings and/or pipe are not allowed and will be required to be removed at the contractor's cost.

1.13 WARRANTY

- A. Division 01 – Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish 5-year manufacturer warranty for Heat tracing cable and controls.
- C. Provide any exceptions with explanation for review.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.2 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.3 ESCUTCHEONS AND PLATES

- A. Solid plates, 316 Stainless Steel with set screws shall be used where the sectional plates will not stay in place or are not available in the required size, or where other individual specification section(s) require one piece or greater quality escutcheons or plates.

2.4 INSULATION

- A. All insulation materials used inside the building on this project, including finishes and adhesives on the exterior surfaces of ducts, pipes and equipment shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as determined by an independent testing laboratory in accordance with NFPA 255 as required by NFPA 90A, unless noted otherwise acceptable.

2.5 ASBESTOS

- A. Materials containing asbestos are not permitted.
- B. If any asbestos-containing material is discovered or suspected, the contractor shall immediately cease any and all work in that area. Cover the exposed material in plastic containment without disturbing the exposed material and notify the Architect and the Owner's representative.
- C. Certify in writing that neither the Contractor nor any of Contractor's subcontractors or suppliers will supply any materials that contain any asbestos in any form for this Project.

PART 3 - EXECUTION

3.1 EXISTING FACILITIES

- A. All piping, valves, fittings, switches, starters, conduit boxes and/or any other items of mechanical or electrical equipment which are not in service at the completion of this contract shall be removed.
- B. Where an existing service to existing building requires disconnection to facilitate installation of this work, this Contractor shall include in his bid the cost of such disconnecting, re-routing and re-connecting. Where any existing facilities which are to remain occupied are affected by disconnection, re-routing or re-connection, then such disconnecting, re-connecting and re-routing shall be done in such a manner so as not to interrupt any service to the building, including but not limited to, sanitary sewer, domestic water, fire protection, alarm, communications, natural gas, refrigerant piping and electrical power. Satisfactory arrangements shall be made with local authorities and/or the various utility companies involved.

1. Impairment tags shall be posted on all system control valves, each fire department connection and other locations required by the AHJ, indicating which systems, or part thereof, has been removed from service.
 2. The method of disconnecting, re-routing and re-connecting shall be as shown on the submitted shop Drawings, or if not shown on the submitted shop Drawings, subject to the approval of the Architect and Owner.
- C. Unless noted otherwise, all equipment and material indicated or specified to be removed shall become the property of the Owner and shall be removed from the site at the discretion of the Owner.
- D. This Contractor shall carefully coordinate work in and around existing services and equipment and adjoining rooms to remodel areas. Coordinate shutdown, removal, capping and turn-on of existing services with the facilities' engineering department and General Contractor to provide continuous (uninterrupted) service throughout the construction period. This Contractor shall refer to the architectural plans and specifications and thoroughly familiarize himself with the construction phasing in remodel areas before beginning work.
- E. Protection during construction: Where existing ceilings are removed during demolition and construction period, the sprinkler head layout shall be modified and heads changed to upright type to provide full fire sprinkler coverage and protection for the entire space and above duct work, lights, etc. that have been left exposed.
- F. Demolition and replacement of existing ceilings, Walls, Partitions and/or floors; that are not identified on the architectural drawing but is required for the removal and/or installation or modification of the fire protection system, this work shall be part of DIV 21 contract. This shall include the removal of the above-mentioned structure and finishes and the Replacement of the above mentioned structure to match existing finishes and/or to accept new finishes as the project dictates.

3.2 ACCESS PANELS

- A. All valves, drains, gauges, etc., must be accessible. The Contractor shall, wherever required to service his installation, coordinate size and location of access panels with General Contractor. Refer to Division 08 – Access Doors and Frames.

3.3 FIRESTOPPING

- A. Firestopping: Unused slots, sleeves and other penetrations in floors, walls or other general construction shall be closed and sealed with an approved firestopping material.
1. Reference Division 07 – Firestopping for appropriate firestopping material required for each wall rating and penetration size and type.
 2. Floor slots and openings shall be closed with 16-gauge galvanized steel sheet supported on 1-inch by 1-inch by 1/8-inch structural angle drilled or supported with powder-driven studs into the building structure. Firestop with a layer of silicone elastomer not less than 1-inch thick which completely fills the opening. The top surface of the silicone elastomer shall be approximately 1 inch below the finished floor slab.
 3. Openings in walls shall be closed with 16-gauge galvanized steel sheet securely attached at the midpoint of the wall thickness and firestopped on both sides of the steel sheet with not less than 1/8-inch thick layer of non-sagging silicone elastomer to fully cover the opening.

4. Single or multiple pipes passing through walls and floors shall have the annular space between pipes or between pipes and structure filled with silicone elastomer to provide a 3-hour rated firestop for floors and walls.

- B. The annulus between exposed pipe and walls or floors, in finished spaces shall be refilled, sealed and painted to match adjacent surfaces.

3.4 CUTTING AND PATCHING

- A. All cutting and patching of floors, walls and ceilings for installation of work covered in these sections will be done by the General Contractor.
- B. Where it becomes necessary to drill into or cut through any existing or completed floors, walls or ceilings to permit the installation of any work under this contract or to repair any defects that may appear up to the expiration of the guarantee, such cutting and patching shall be done by the General Contractor under the supervision of the Architect.
- C. No joists, beams, girders or columns shall be cut without first obtaining written permission from the Architect or Structural Engineer.
- D. Methods of cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations approved by the Architect/Engineer. Impact type equipment shall not be used except where specifically approved by the Architect/Engineer. Openings in precast concrete slabs for pipes, etc., shall be core drilled to exact size.
- E. Where core drilling or saw cutting of concrete floor or wall penetrations is required, work shall be performed in accordance with Division 03 Specifications. Where applicable Division 03 Specifications are not included in the Project, core drilling shall be in accordance with generally accepted standards and be performed by licensed personnel where applicable.
- F. Contractor shall use ground penetrating radar (GPR) to scan areas of concrete prior to core drilling or saw cutting for embedments. Contractor shall clearly mark locations of embedments for review by Structural Engineer or owner's construction representative before core drilling or saw cutting.
- G. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner approved by the Architect/Engineer.
- H. Plaster: All mechanical work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- I. All drilling for expansion bolts, hangers and other supports shall be done subject to be approval of the Architect or Structural Engineer. Labor and materials required to replace or rebuild parts or injured portions shall be furnished at the Contractor's expense, subject to the satisfaction of the Architect.
- J. Restoration: All openings shall be restored to "as new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.

- K. The annulus between exposed pipe and walls or floors, in finished spaces shall be refilled, sealed and painted to match adjacent surfaces.
- L. Opening and Closing Pavement and/or Concrete Flatwork: Cut and patch existing pavement, concrete flatwork, etc. as required to perform work in the contract, satisfactory to the Architect/Engineer. Existing construction shall be machine-cut on straight lines. Unless otherwise described in "Excavating and Backfill", sub-base, base course and paving materials shall be equal to existing materials as required by other Divisions of these specifications or as required to match existing conditions. Materials shall be thoroughly compacted to required (or adjacent) densities and thicknesses and shall be finished level with adjacent surfaces.

3.5 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers and equipment. Locate piping, sleeves, inserts, hangers and equipment clear of windows, doors, openings, light outlets, ductwork and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items and valves. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- E. Minor Piping: Generally, small diameter pipe runs from drips and drains and other services are not shown but must be provided.
- F. Install gages, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- G. Work in Existing Building: Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to Cutting and Patching article in Part 3 of this section.

3.6 UNIONS

- A. No unions are to be placed in any pipe in a location which will be concealed or inaccessible after completion of the building unless furnished with an access panel either as shown on the Drawings or as specified herein. Unions must be installed on each side of all pieces of equipment such as heating units, pumps, etc., so that such equipment may be readily disconnected.

3.7 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities, when required by the phasing or called for specifically on the plans.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- C. When construction is complete, temporary facilities and piping shall be completely removed back to the nearest active distribution branch or main pipe line and any openings in structures sealed. Dead legs in potable water systems will not be allowed. Provide necessary blind flanges and caps to seal open piping remaining in service.
- D. Provide temporary fire protection during the construction phase of Project. Inform and obtain approval from the Owner and General Contractor for any interruptions of existing fire protection, domestic water or fire alarm systems.

3.8 DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor. Such access shall be provided without additional cost or time to the Owner. Where work is in an operating facility, provide approved protection from dust and debris at all times for the safety of personnel and maintenance of building operation and environment of the facility.
- B. In an operating facility, maintain the operation, cleanliness and safety. The Owner's personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and facility operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of facility operation. Perform all flame cutting to maintain the fire safety integrity of this facility. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards.
- C. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- D. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from the property expeditiously and shall not be allowed to accumulate.
- E. At any time work is occurring when the building is occupied, avoid using tools that create excessive noise that might disrupt the building operations (e.g. concrete breaking equipment, excavating equipment, hammer drills, screw guns, etc.). Use other types of tools or schedule work to occur outside of normally occupied hours. Carefully plan water control for all coring and sawing operations to prevent damage and disruption of occupants.

3.9 FIRE ALARM INTERFACE

- A. Ensure that all required fire protection system alarm devices are installed and connected as required to the fire alarm system; including but not limited to: flow switches, tamper switches and alarm notifications.

3.10 UTILITIES

- A. The Contractor shall arrange and pay for any necessary revisions to existing utility services, including meter deposits and connection fees to all serving utility companies and shall install utilities, where applicable.

3.11 INDOOR AIR QUALITY CONTROL:

- A. All Adhesives, sealants, paints, coatings applied within the weatherproofed interior of the building shall comply with applicable VOC thresholds of SCAQMD 1113 and 1168.

3.12 PAINTING

- A. Paint all exposed fire sprinkler pipe. Paint color shall be submitted and acceptable to the Architect and Engineer. Where the color is other than Red; then the pipe shall also be labeled.
- B. Surfaces to be painted and types of paint shall be as specified in the Architectural specifications. Refer to Division 09.
- C. All surfaces to be painted shall be thoroughly cleaned, all rust scraped off and all oil and grease removed before any paint is applied.
- D. Under no conditions shall paint be applied to sprinkler heads, escutcheons, or covers. If paint is so applied, replacement of the affected parts shall be required.
- E. Finishing paint coats shall not be applied until all the plastering or other structural building work is completed. Cloths shall be spread where necessary to prevent drops of paint, oil, etc. from defacing walls, floors, etc., and the Contractor shall be held responsible for all damage by neglect of such precautions. The finished conditions of the painting shall be subject to the approval of the Architect, who may require retouching or repainting of surfaces not properly finished.

3.13 EXCAVATING AND BACKFILLING

- A. The Contractor shall do all excavating and backfilling necessary for the installation of the work, including shoring, bailing and pumping to maintain his trenches and keep them in dry condition until the work in question has been tested and approved.
- B. Care shall be taken that piping is properly and uniformly graded and that trench beds are well rammed and that ground under pipelines is firm and secure before piping is laid. All trenches must be backfilled with clean sand, four inches under pipe, rammed down, soaked with water and made solid. All surplus material shall be removed and carted away.
- C. The Contractors will be responsible for resurfacing all areas after trenches have been backfilled.
- D. The Contractor is directed to comply with all OSHA Requirements and State Requirements regarding trench safety.

- E. Perform all work with the highest regard to safety and in accordance with U.S. 29 CFR 1926 "Safety and Health Regulations for Construction". Special attention shall be directed to Subpart P – Excavations. Refer also to 230010.1.12 – Safety.
1. Safety Precautions and Programs
 - a. In excavations that are four (4) feet or more in depth, means of egress shall be provided by stairway, ladder, ramp or other safe means so as to require no more than twenty-five (25) feet of lateral travel for employees.
 - b. In addition, on projects in which trench excavation will have a depth of five feet or more, the Contractor, and all of their subcontractors, shall comply with all requirements of 29 CFR 1926 Subpart P 652 "Safety and Health Regulations for Construction – Excavations" and all Appendices related thereto.
 - c. Before commencing any trench excavation that will be five (5) feet deep or deeper, provide Owner, through A/E, with detailed plans and specifications regarding the safety systems to be utilized. Said plans and specifications shall include a certification from a registered professional engineer indicating full compliance with the 29 CFR 1926 Subpart P -- Excavations.
 - d. Contractor shall ascertain, prior to proposal, whether or not such conditions prevail and services are needed, and shall include cost of same in proposal.
 2. All shoring and bracing shall be designed so that it is effective to the bottom of the excavation. Sheet piling, sheet piling, bracing, shoring, trench boxes, and other methods of protection, including sloping, shall be based upon the condition and nature of the materials to be retained, and by loads (including surcharge) imparted to the sides of excavation by equipment and stored materials.
 3. Store excavated or other materials a minimum of two feet (2') from the edge of any excavation. Retain such materials to prevent their falling or sliding into the excavation, and to prevent excessive pressure on the sides of the excavation.
 4. Maintain sides and slopes of excavations in a safe condition by scaling, benching or barricading.
 5. Take other precautions via shoring and bracing to prevent slides or cave-ins. Take special precautions when trenches are located adjacent to backfilled excavations, or subjected to vibrations from railroads, highway traffic, operation of machines, etc.
- F. Verify locations of all existing utilities in the area prior to start of excavation (gas, electrical, water, sanitary, storm, telephone, cable TV, optical cable, etc.). Coordinate with utility companies as required.
1. Excavation within four feet (4') of existing utilities shall be done by hand digging only.
- G. Where conditions require concrete or other materials to be placed against undisturbed earth surfaces, any loosened or disturbed materials shall be removed from such surfaces.
- H. Trenching
1. Trenches shall be large enough to permit handling of pipe and accessories and making connections. Trench bottom width shall exceed coupling diameters by at least twelve inches (12").
 2. Trenches in rock, soil containing rocks larger than two (2) inches in any dimension, and other non-uniform materials, shall be four (4) inches minimum and twelve inches (12") maximum below the bottom of the pipe to provide for a bedding course.
- I. Preparation of Trench Bottom

1. If the excavation is carried below the finished flow line grade of the pipe in order to remove unsuitable material or for any other reason, the trench shall be course bedded to within six inches (6") of the finished flow line grade of the pipe bottom with compacted load-bearing backfill. A bedding course as specified below shall then be placed over the load-bearing backfill.
2. Trenches shall be dry when the trench bottom is prepared. A continuous trough with compacted bedding course shall be prepared to receive the bottom quadrant of the pipe barrel. Remove loose or disturbed material and bring the trench bottom up to grade with bedding material as follows:
 - a. For active soils where metallic piping is used, washed pea gravel with material no larger than 1/2 inch in largest dimension shall be utilized. Provide a Bentonite plug in the trench at the building perimeter where site drainage or other conditions could permit water intrusion into the trench under the building. Bentonite plug to extend 2 ft. on either side of the perimeter grade beam. (Sand bedding material may be substituted beyond ten (10) feet from building line only.)
 - b. NOTE: Confirm soil conditions prior to trenching. In general, soils with a plasticity index (PI) over 10 at depths to be encountered are considered active. Refer to Geotechnical Report included in project Specifications for PI value and additional information.
3. In addition, for bell joint pipe, excavation for the bell or coupling shall be so that the pipe will bear on the trench bottom along the entire length of the barrel.
4. Prepare the trench bottom carefully so that when placed in its final position, the pipe will be true to line and grade and uniformly supported.

J. Laying Pipe

1. All pipe shall be clean at the time it is placed in the line. Open ends of pipe sections already in place shall be tightly plugged to prevent the entrance of trench water, mud, dirt, etc.
2. Keep trench bottom free of frost, frozen earth or standing water at the time of pipe laying and jointing.

K. Compaction

1. Where compaction is indicated by specifications, accomplish same with vibratory or rammer type compactor, minimum of two full width passes.
2. Compaction below slabs, roads, flatwork, or other construction elements shall be performed to the requirements of compaction for those elements. Coordinate with general construction trades and other Division's specifications.

L. Backfilling

1. Clean trenches and backfill material of any organic material, roots, trash, lumber, other debris and frozen material prior to backfilling. Backfill material shall contain no organic material, roots, trash, lumber, other debris or frozen material. Backfill material under slabs inside building shall match adjacent materials and be of density acceptable to the A/E.
2. Backfilling by means of sluicing or flooding with water is not permitted. Backfill shall not be placed on frozen ground.
3. Partially backfill immediately after the pipe is laid (unless other methods for anchoring pipe are provided). Leave joints exposed for hydrostatic testing. Water shall not be permitted to rise in unbackfilled trenches after pipe has been placed.

4. Whenever timber or other sheeting is driven to a depth below the elevation of the top of the pipe, that portion of the sheeting below a point four feet above the elevation of the top of the pipe shall not be disturbed or removed.
5. Pipe layer backfill (bedding material under the bottom quadrant of the pipe, around sides, and up to a point one foot above the top of the pipe) shall be: sand or select material containing rocks no larger than 1/2 inch in greatest dimension (sand only shall be used with all plastic piping systems or plastic jacketed piping systems); except that pipe layer backfill below slabs in active soils shall be washed pea gravel of 1/2 inch minus dimensions. Backfill below slabs may utilize flowable fill.
6. Backfill material shall be placed and compacted in six inch (6") layers. Backfill shall be brought up evenly on both sides of the pipe simultaneously to avoid damage or displacement from unbalanced loading.
7. Joints shall not be covered with backfill until pressure and leak testing is completed.
8. Backfill to grade (above pipe layer).
 - a. Active Soils: Where active soils are encountered backfill to grade within ten (10) feet of building line shall be uncompacted washed pea gravel to match the pipe layer backfill specified above.

M. The Contractor shall also comply with requirements set forth in Division 31 Specifications.

3.14 ESCUTCHEONS AND PLATES

- A. Where pipes pass through ceilings or walls in finished spaces, install sectional plates or escutcheons to cover the annular opening between pipe and sleeve..
- B. The annulus between pipe and walls or floors, shall be filled with Sonolastic NP unless fire wall or barrier then the approved UL listed fire assembly shall be used.
- C. Inside diameter of escutcheons shall fit around insulation and around pipe when not insulated; outside diameter shall cover sleeve. Secure escutcheons or plates to pipe or sleeve but not to insulation. All escutcheons shall be triple nickel-chromium plated brass, or Type 316L stainless steel.

3.15 CLOSE OUT DOCUMENTATION AND TESTING REPORTS

- A. Contractor shall provide Project Record Documents, Operation and Maintenance data and all product warranty data as specified in Division 01.
- B. Contractor shall provide copies of all fire protection system tests and certification reports for inclusion in project close out documents. Reports shall include, but shall not be limited to, the following:
 1. Acceptance testing for various fire protection systems, as required by appropriate NFPA standard.
 2. Contractor's Material and Test Certificates.
 3. Final approval documentation from local Fire Department.
 4. Backflow prevention assembly certifications.
- C. Contractor shall provide As-Built Fire Protection Drawings, as hard copies and/or electronic format as required by Owner.

END OF SECTION

SECTION 22 00 01 - BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Basic Plumbing Requirements specifically applicable to each Division 22 Section, in addition to Division 01 - General Requirements.

1.2 REFERENCES

- A. All references in Division 22 to codes, standards or other publications shall be the latest edition/version, unless noted otherwise.

1.3 PLANS

- A. These specifications are accompanied by plans indicating typical layouts, pipe and equipment location, etc. The plans and these specifications are complimentary each to the other and what is called for by one shall be as binding as if called for by both. Should there be a conflict between drawings and specifications regarding a material shown of work described or detailed then the material of work having the greater value shall be provided.
- B. The plans as prepared are in general diagrammatic. The contractor shall carefully lay out his work at the site to conform to the architectural, mechanical, electrical and structural conditions to provide grading of piping, to avoid all obstructions and to conform to details of installation as shown on the plans and supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated satisfactorily operating installation. **The General Contractor must coordinate the work of all trades.** All necessary offsets in piping, fittings, ductwork, etc. required to avoid interferences between piping, equipment, structural and architectural work are not shown but shall be furnished and installed by the contractor without additional expense to the Owner.
- C. These specifications and plans accompanying same are intended to cover systems which will not interfere with the design of the building, which will fit into the available spaces, and which will insure complete and satisfactory systems. Each contractor shall, therefore, carefully examine the plans and the building and shall be responsible for the proper fitting of his material and apparatus into the building.
- D. The size of plumbing equipment indicated on the plans is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space with the manufacturer's recommended clearances allocated for same on the plans. It shall be the Contractor's responsibility to furnish data to evidence that sufficient space can be provided for the installation of proposed equipment and that adequate access will exist for servicing and maintenance of equipment. Should changes become necessary during construction, the contractor shall make such necessary changes at his (the Contractor's) own expense.
- E. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention no later than ten (10) days prior to the bid date, unless specified otherwise in Division 1. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus or equipment.

1.4 CHANGES

- A. Any changes from the plans necessary to make this work conform to the building as it is constructed, to make this work fit the work of other trades or to make this work conform to the rules of city and municipal bodies having jurisdiction shall be made by this contractor at no additional cost to the Owner. However, no changes shall be made from the work described on the plans and these specifications except on written order from the Architect.
- B. If any changes are required other than those mentioned above and the changes involve extra work on the part of the contractor, no charges for this extra work shall be allowed unless authorized in advance of the work by a written order from the Owner and/or Architect stating the charges to be made for the work.
- C. Proposed use of item or equipment other than that specified or indicated may require redesign of structure, partitions, foundations, piping, wiring, or other parts of mechanical, electrical, or architectural layout. Redesign, new drawings, and detailing required shall be prepared and submitted to Architect/Engineer for approval.
- D. Where approved deviation requires different quantity, size and arrangement of wiring, conduit, equipment, etc. from that specified or indicated; provide such items and all other additional equipment required by system at no additional cost to the Owner.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protection:
 - 1. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation.
 - 2. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 - 3. Damaged equipment or material shall be replaced with new as determined and directed by the Architect or Engineer. In particular, piping insulation which becomes saturated will be rejected and must be removed from the job site. Such repair or replacement shall be at no additional cost to the Owner.
 - 4. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
 - 5. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
- B. Cleanliness of Piping and Equipment Systems:
 - 1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
 - 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
 - 3. Clean interior of all tanks prior to delivery for beneficial use by the Owner.
 - 4. Boilers shall be left clean following final internal inspection by the inspector.
 - 5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.6 SUBSTITUTIONS

- A. The materials, products and equipment described and specified establish a standard of quality, function, dimension and appearance to be met by any proposed substitutions.
- B. Reference Division 01 – Product Requirements.
- C. Substitution requests are only required where specific manufacturers are listed or scheduled.

1.7 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. The Contractor shall furnish copies of the manufacturer's literature and drawings describing all proposed equipment and materials indicated in the specifications. The proposed use of the exact equipment and materials specified shall not change this requirement of including literature describing the proposed equipment. Manufactured items proposed for use, whether specified or proposed for substitution, shall be the current, catalogued product of the manufacturer, and replacement parts shall be available.
- C. Manufacturer's regular catalog sheets will not be acceptable under this requirement unless they indicate completely all of the specification requirements. Where drawings cover several sizes or types of construction they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submitted item with its respective specified item. Annotate all submittal data to indicate exact model, size, and type submitted.
- D. Brochures shall contain a certification that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described and that approval is recommended. The certification shall be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required actions. Any deviation from the requirements of the specifications shall be clearly noted and marked for the Engineer's consideration.
- E. Approval of the brochures, or any part of the contents therein, shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called in writing to proposed deviations at the time of transmittal of the brochures and such deviations have been approved, nor shall it eliminate the requirements or the responsibilities, if there are errors of any sort in the data submitted.

1.8 INTERFERENCES AND COOPERATION

- A. The plans are generally diagrammatic and the Contractor shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work will be avoided. Not all offsets in piping, ductwork, etc., are shown. The Contractor shall cooperate with the General Contractor and all other contractors to coordinate their work to avoid interferences and delays and arrange all parts of the work to harmonize in service and appearance with all other parts.

- B. Provide an overhead coordination submittal per Division 01 The submittal shall include all structural, plumbing, mechanical, electrical, and fire protection components.

1.9 MATERIALS AND WORKMANSHIP

- A. All materials shall be new, of the quality specified and free of any defects. Manufacturer's names are listed to establish a standard of quality and construction.
- B. The Contractor will be responsible for transportation of his materials to the job and for their storage and protection until the final acceptance of the job.
- C. Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds and all labor required for the safe and expeditious execution of his contract.

1.10 PERMITS AND INSPECTIONS

- A. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid for by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, state and municipal regulations and other authorities who may have lawful jurisdiction over the work being done.
- B. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling AHJ required inspections through the General Contractor to allow inspections to be performed without impeding the progress of construction. Generally, the Contractor shall plan for inspections to occur two (2) weeks prior to the scheduled concealment of work in the area of inspection.

1.11 ENGINEERING DESIGN TEAM OBSERVATIONS

- A. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling progress observations through the General Contractor to allow for the following observations to be performed without impeding the progress of construction. Generally the Contractor shall plan for observations to occur two (2) weeks prior to the scheduled concealment of work in the area of observation.
- B. In general, observations for this project shall include but not be limited to:
 - 1. Exterior Below Grade: Site utilities and services.
 - 2. Interior Below Grade: Utilities, services and systems.
 - 3. Rough Wall: All utilities, services and systems in-place including wall studs, cross bracing, supports, etc. (No sheetrock or insulation).
 - 4. Corrected Rough Wall: (Before Sheetrock).
 - 5. Above Ceiling: All utilities, services and systems in place, labeling on exposed piping (No insulation on piping systems. Ceiling grid/channels may be installed but no sheetrock or ceiling tile).
 - 6. Above Ceiling Final: All utilities, services and systems complete including hangers, insulation, and labeling (ceiling grid and/or channel may be in place but no sheetrock or ceiling tile shall be installed).
 - 7. Substantial Completion: All surfaces complete, fixtures installed and trim-out complete.
 - 8. Final: Cleaned and ready for occupancy.

1.12 EXAMINATION OF SITE

- A. All Contractors submitting proposals for this work shall first examine the site and all conditions thereon and therein. All proposals shall take into consideration conditions as may affect the work under this contract. They shall satisfy themselves as to existing grades and the actual formation, and soil conditions.
- B. Contractors shall verify all service locations, depths, sizes, etc. No information given on the plans shall relieve the Contractor of this responsibility.
- C. Before starting work, the Contractor shall verify all associated existing systems, pipe sizes, locations, and dimensions so that the new systems can be properly connected as indicated on the documents.

1.13 QUALITY ASSURANCE

- A. Perform Work in accordance with all codes listed on the drawing sheets, the local authority having jurisdiction (AHJ), and the Architect/Engineer. As the minimum standard for the level of quality, in all cases the greater quantity or better quality shall be the first consideration for the basis of an acceptable product or process. The local authority having jurisdiction, the Architect and the Engineer shall have the final authority on the approval and/or use of any product or process specified or submitted for substitution. The greater quality and/or value specified herein for the system(s) and various components and installation procedures shall take precedence over the minimum requirements of the herein before mentioned codes.
- B. Equipment and Components: Bear UL, ASME, ANSI and/or NSF label or marking, as specified in appropriate Section.
- C. Valves: Provide manufacturer's name and pressure rating marked on valve body.
- D. Piping: All piping installed on this project shall bear the complete ASTM and Manufacturer's marking. Labeling and identification requirements as required by ASTM. All installed piping 5'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed, to meet this requirement.
- E. Lead free components: All wetted surfaces of piping, fittings, valves and other products in contact with the potable water system shall be certified as lead free, as per current requirements of NSF/ANSI 61 and/or NSF/ANSI 372.
- F. Welding Materials and Procedures: Perform to ASME Code.

1.14 AUTOMATIC CONTROLS ALLOWANCE

- A. Where "automatic controls" are called for in the plans and specifications, all the control instruments, such as motorized valves, etc., shall be provided by the Contractor. The Drawings may show some power connections to controls equipment; however, if more power is required, then the Contractor shall provide this power.

1.15 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- E. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- F. Electrical and Pneumatic Interconnection of Controls and Instruments: This is generally not shown but must be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Comply with NFPA-70.
- G. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- H. Work in Existing Building: Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to Cutting and Patching article in Part 3 of this section.

1.16 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities, when required by the phasing or called for specifically on the plans.

1.17 PLUMBING DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor. Such access shall be provided without additional cost or time to the Owner. Where work is in an operating facility, provide approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the facility.

1.18 UTILITIES

- A. The Contractor shall coordinate work and arrange and pay for any necessary revisions to existing utility services, including meter deposits and connection fees to all serving utility companies and shall install utilities, where applicable.
- B. The Contractor shall be responsible for all costs associated with the extension of utilities to the Building, including but not limited to natural gas, domestic water, sanitary sewage and storm drain piping.
- C. The Contractor shall be responsible for gathering all information required by the connecting utility service provider (i.e. drawings, load information, completing and submitting required forms, etc.) The contractor may utilize the design team to obtain information, however, the contractor is responsible for submitting all required documentation to the utility provider. This includes, but is not limited to, new gas service, medium pressure gas request forms, water meter sizing forms, etc.).
- D. The Contractor shall provide the utility service provider a date that the utility connection is needed. This date shall be coordinated with the utility service provider to take into consideration the design time and mobilization.

1.19 INDOOR AIR QUALITY CONTROL:

- A. All Adhesives, sealants, paints, coatings applied within the weatherproofed interior of the building shall comply with applicable VOC thresholds of SCAQMD 1113 and 1168.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.2 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.3 ESCUTCHEONS AND PLATES

- A. Solid plates, 316 Stainless Steel with set screws shall be used where the sectional plates will not stay in place or are not available in the required size, or where other individual specification section(s) require one piece or greater quality escutcheons or plates. All escutcheons shall be triple nickel-chromium plated brass, or type 316L stainless steel.

2.4 INSULATION

- A. All insulation materials used inside the building on this project, including finishes and adhesives on the exterior surfaces of ducts, pipes and equipment shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as determined by an independent testing laboratory in accordance with NFPA 255 as required by NFPA 90A, unless noted otherwise acceptable.

2.5 HEAT TRACING OF PIPING EXPOSED TO FREEZING CONDITIONS

- A. Furnish and install a complete UL listed system of heaters, components and controls to prevent freezing of domestic water piping exposed to freezing conditions. The heat trace system utilized on the combined domestic/fire protection water line within the building shall be listed specifically for use on fire suppression piping.
- B. Heat trace system shall be equivalent to Raychem "XL-Trace," utilizing a self-regulating cable with an output 5 watts/foot with 277 VAC supply voltage (Raychem 5XL2-CR).
- C. Power connection, end seal, splice and tee kit components shall be applied in the field.
- D. The heat trace system shall be controlled by a heat-tracing power distribution panel complete with main circuit breaker, door disconnect switch, alarm relay and alarm horn ground-fault and monitoring for group control of multiple circuits. Panel shall be equivalent to Raychem Model HTPG.
- E. The system shall be controlled thru an ambient temperature sensor, Raychem model RTD-200 or equal, set to energize heat trace below 40 degrees F.
- F. Heater shall be installed linearly on the pipe after piping has been successfully pressure tested. Heater shall be secured to pipe with cable ties or type PF-1 polyester tape as specified by the manufacturer.
- G. System shall be tested in accordance with manufacturer's recommendations prior to the application of the thermal insulation as specified in Section 22 07 00.

2.6 SOLENOID VALVES

- A. All solenoid valves used in piping systems shall be the slow acting type.

2.7 ASBESTOS

- A. Materials containing asbestos are not permitted.
- B. If any asbestos-containing material is discovered or suspected, the contractor shall immediately cease any and all work in that area. Cover the exposed material in plastic containment without disturbing the exposed material and notify the Architect and the Owner's representative.
- C. Certify in writing that neither the Contractor nor any of Contractor's subcontractors or suppliers will supply any materials that contain any asbestos in any form for this Project.

PART 3 - EXECUTION

3.1 EXISTING FACILITIES

- A. All piping, valves, fittings, switches, starters, conduit boxes and/or any other items of plumbing, mechanical or electrical equipment which are not in service at the completion of this contract shall be removed, unless otherwise noted.
- B. Where an existing service to existing building requires disconnection to facilitate installation of this work, this Contractor shall include in his bid the cost of such disconnecting, re-routing and re-connecting. Where any existing facilities, which are to remain occupied, are affected by disconnection, re-routing or re-connection, then such disconnecting, re-connecting and re-routing shall be done in such a manner so as not to interrupt any service to the building. Satisfactory arrangements shall be made with local authorities and/or the various utility companies involved. The method of disconnecting, re-routing and re-connecting shall be as shown on the Drawings, or if not shown on the drawings, subject to the approval of the Architect and Owner.
- C. Unless noted otherwise, all equipment and material indicated or specified to be removed shall become the property of the Contractor.
- D. This Contractor shall carefully coordinate work in and around existing services and equipment and adjoining rooms to remodel areas. Coordinate shut-down, removal, capping, and turn-on of existing services with the Owner's facilities' department and general contractor to provide continuous (uninterrupted) service throughout the construction period. This Contractor shall refer to the architectural plans and specifications and thoroughly familiarize himself with the construction phasing in remodel areas before beginning work.
- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean up of construction and demolition debris on all floor surfaces and on all equipment being operated by the Owner.

3.2 PLUMBING DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor. Such access shall be provided without additional cost or time to the Owner. Where work is in an operating facility, provide approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the facility.
- B. In an operating facility, maintain the operation, cleanliness and safety. The Owner's personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and facility operation. Confine the work to the immediate area concerned; maintain cleanliness and

wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of facility operation. Perform all flame cutting to maintain the fire safety integrity of this facility. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards.

- C. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled. This SHALL include the crawlspace as well. Removed and unused material SHALL be taken out from the crawlspace; daily.
- D. At any time work is occurring when the building is occupied, avoid using tools that create excessive noise that might disrupt the building operations (e.g. concrete breaking equipment, excavating equipment, hammer drills, screw guns, etc.). Use other types of tools or schedule work to occur outside of normally occupied hours. Carefully plan water control for all coring and sawing operations to prevent damage and disruption of occupants.

3.3 INTERFERENCES AND COOPERATION

- A. The plans are generally diagrammatic and the Contractor shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work will be avoided. Not all offsets in piping, ductwork, etc., are shown. The Contractor shall cooperate with the General Contractor and all other contractors to coordinate their work to avoid interferences and delays and arrange all parts of the work to harmonize in service and appearance with all other parts.
- B. The General Contractor shall coordinate the work of all trades. The various systems to be installed shall follow the normal, common sense priority of systems installation with the highest system to lowest system installation as follows:
 - 1. HVAC ductwork shall be installed up and against building (floor/roof) structural members.
 - 2. Sanitary waste and storm drainage piping system shall begin horizontal routing as high as possible between structural members, offsetting vertically only to avoid conflict with structure or to drop below HVAC ductwork where offset is unavoidable.
 - 3. Electrical conduit shall be installed up, and against building structure, running parallel with HVAC ductwork and offsetting up into structural bay (void) or below HVAC ductwork to obtain a change in direction or branch take-off. Electrical conduit installation shall not control or dictate the routing or installation of the HVAC ductwork storm drain piping or sanitary waste and vent piping.
 - 4. Domestic water piping (hot water, cold water and hot water return), medical gas piping and HVAC piping shall be installed beside and below the HVAC ductwork and electrical conduit. Preferred installation shall be on trapeze, wall brackets, or racked on vertical channel on the wall above the ceiling line. The completed installation shall not conflict with the installation or removal of ceiling system components of tile. All main and branch take-off isolation valves, strainers, sensors and other plumbing equipment shall be readily identifiable and accessible from a standing position on a step ladder, **no more than 18 inches above ceilings**.
 - 5. Fire sprinkler piping system shall be installed below all other systems and components, unless noted otherwise or as coordinated with all other trades. The fire sprinkler piping

shall not conflict with the installation or removal of ceiling system components or tile. The fire sprinkler system piping layout and installation shall be coordinated by the fire sprinkler contractor and the General Contractor with all other trades performing work in the affected area, to avoid conflict with the installation or removal of any other systems components, or to prevent ready access to valves, equipment of the other trades. Do not install sprinkler piping until ductwork mains are in place.

- C. Provide an overhead coordination submittal per Division 01 The submittal shall include all structural, plumbing, mechanical, electrical, and fire protection components.

3.4 TEMPORARY PIPING AND EQUIPMENT

- A. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service.
- B. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- C. When construction is complete, temporary facilities and piping shall be completely removed back to the nearest active distribution branch or main pipe line and any openings in structures sealed. Dead legs in potable water systems will not be allowed. Provide necessary blind flanges and caps to seal open piping remaining in service.

3.5 UNIONS

- A. No unions are to be placed in any pipe in a location which will be concealed or inaccessible after completion of the building unless furnished with an access panel either as shown on the drawings or as specified herein. Unions must be installed on each side of all pieces of equipment such as water heaters, water softeners, thermostatic mixing valves, flow regulators, pumps, etc., so that such equipment may be readily disconnected in location that equipment can be disconnected and removed.

3.6 ACCESS PANELS

- A. All valves, traps, drains, cleanouts, equipment, etc., must be accessible. The Contractor shall, wherever required to service his installation, coordinate size and location of access panels with General Contractor. Refer to Section 08 31 13 – Access Doors and Frames.

3.7 FIRESTOPPING

- A. Firestopping: Unused slots, sleeves and other penetrations in floors, walls or other general construction shall be closed and sealed with an approved firestopping material.
 - 1. Reference Section 07 84 00 – Firestopping for appropriate firestopping material and method of installation required for each wall rating and penetration size and type to comply with the appropriate UL listing.
 - 2. Floor slots and openings shall be closed with 16 gauge galvanized steel sheet supported on 1-inch by 1-inch by 1/8-inch structural angle drilled or supported with powder-driven studs into the building structure. Firestop with a layer of silicone elastomer not less than 1-inch thick which completely fills the opening. The top surface of the silicone elastomer shall be approximately 1-inch below the finished floor slab.

3. Openings in walls shall be closed with 16 gauge galvanized steel sheet securely attached at the midpoint of the wall thickness and firestopped on both sides of the steel sheet with not less than 1/8-inch thick layer of non-sagging silicone elastomer to fully cover the opening.
 4. Single or multiple pipes passing through walls and floors shall have the annular space between pipes or between pipes and structure filled with silicone elastomer to provide a rated firestop (rated to match the assembly) for floors and walls.
- B. The annulus between exposed pipe and walls or floors in finished spaces shall be refilled, sealed and painted to match adjacent surfaces.
- C. Future Slots: Cap ends of sleeve and mark as future.

3.8 SEALING PENETRATIONS

- A. The annulus between exposed pipe, sleeves and walls or floors in finished spaces shall be refilled, sealed and painted to match adjacent surfaces. For Rated walls (Fire or smoke) provide the correct UL/FM listed sealing assembly for that application.

3.9 CUTTING AND PATCHING

- A. All cutting and patching of floors, walls and ceilings for installation of work covered in these sections will be done by the General Contractor.
- B. Where it becomes necessary to drill into or cut through any existing or completed floors, walls or ceilings to permit the installation of any work under this contract or to repair any defects that may appear up to the expiration of the guarantee, such cutting and patching shall be done by the General Contractor under the supervision of the Architect.
- C. No joists, beams, girders or columns shall be cut without first obtaining written permission from the Architect or Structural Engineer.
- D. Methods of cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations approved by the Architect/Engineer. Impact type equipment shall not be used except where specifically approved by the Architect/Engineer. Openings in precast concrete slabs for pipes, etc., shall be core drilled to exact size.
- E. Where core drilling or saw cutting of concrete floor or wall penetrations is required, work shall be performed in accordance with Division 03 Specifications. Where applicable Division 03 Specifications are not included in the Project, core drilling shall be in accordance with generally accepted standards and be performed by licensed personnel where applicable.
- F. Contractor shall use ground penetrating radar (GPR) to scan areas of concrete prior to core drilling or saw cutting for embedments. Contractor shall clearly mark locations of embedments for review by Structural Engineer or owner's construction representative before core drilling or saw cutting.
- G. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner approved by the Architect/Engineer.

- H. Plaster: All mechanical work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- I. All drilling methods for expansion bolts, hangers and other supports shall be done subject to be approval of the Architect or Structural Engineer. Labor and materials required to replace or rebuild parts or injured portions shall be furnished at the Contractor's expense, subject to the satisfaction of the Architect.
- J. Restoration: All openings shall be restored to "as new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.
- K. Opening and Closing Pavement and/or Concrete Flatwork: Cut and patch existing pavement, concrete flatwork, etc. as required to perform work in the contract, satisfactory to the Architect/Engineer. Existing construction shall be machine-cut on straight lines. Unless otherwise described in "Excavating and Backfill", sub-base, base course and paving materials shall be equal to existing materials as required by other Divisions of these specifications or as required to match existing conditions. Materials shall be thoroughly compacted to required (or adjacent) densities and thicknesses and shall be finished level with adjacent surfaces.

3.10 PAINTING

- A. Types of paint shall be as specified in the Architectural specifications. Surfaces to be painted are identified in Division 09 and on the drawings. All exposed gas piping shall be painted as noted in Section 22 11 23.
- B. All surfaces to be painted shall be thoroughly cleaned, all rust scraped off and all oil and grease removed before any paint is applied.
- C. Finishing paint coats shall not be applied until all the work is completed. Cloths shall be spread where necessary to prevent drops of paint, oil, etc. from defacing walls, floors, etc., and the Contractor shall be held responsible for all damage by neglect of such precautions. The finished conditions of the painting shall be subject to the approval of the
- D. Architect, who may require retouching or repainting of surfaces not properly finished.

3.11 SLEEVES, ESCUTCHEONS AND PLATES

- A. Where pipes pass through ceilings (any type: i.e. lay-in, gypsum, etc.), floors and/or walls in ALL spaces, install sleeves.
- B. Where pipes pass through ceilings or walls in finished spaces, install sectional plates or escutcheons to cover the annular opening between pipe and sleeve.
- C. The annulus between pipe and walls or floors, shall be filled with A One-component, elastomeric, gun-grade polyurethane sealant; Sonolastic NP or equal; unless fire wall or barrier then the approved UL listed fire assembly shall be used.
- D. Inside diameter of escutcheons shall fit around insulation and around pipe when not insulated; outside diameter shall cover sleeve. Secure escutcheons or plates to pipe or sleeve but not to insulation. All escutcheons shall be triple nickel-chromium plated brass, or Type 316L stainless steel.

3.12 PRODUCTS NOT FURNISHED BUT INSTALLED UNDER DIVISION 22.

- A. Rough-in for and make final connection to Owner furnished fixtures and equipment requiring plumbing services.
- B. Rough-in for and make final connection to fixtures and equipment furnished under other divisions of these Contract Specifications requiring plumbing services.

3.13 EXCAVATING AND BACKFILLING

- A. The Contractor shall do all excavating and backfilling necessary for the installation of the work, including shoring, bailing and pumping to maintain his trenches and keep them in dry condition until the work in question has been tested and approved.
- B. Care shall be taken that piping is properly and uniformly graded and that trench beds are well rammed and that ground under pipelines is firm and secure before piping is laid. All trenches must be backfilled with clean sand, four inches under pipe, rammed down, soaked with water and made solid. All surplus material shall be removed and carted away.
- C. The Contractors will be responsible for resurfacing all areas after trenches have been backfilled.
- D. The Contractor is directed to comply with all OSHA Requirements and State Requirements regarding trench safety.
- E. Perform all work with the highest regard to safety and in accordance with U.S. 29 CFR 1926 "Safety and Health Regulations for Construction". Special attention shall be directed to Subpart P – Excavations. Refer also to 230010.1.12 – Safety.

1. Safety Precautions and Programs

- a. In excavations that are four (4) feet or more in depth, means of egress shall be provided by stairway, ladder, ramp or other safe means so as to require no more than twenty-five (25) feet of lateral travel for employees.
 - b. In addition, on projects in which trench excavation will have a depth of five feet or more, the Contractor, and all of their subcontractors, shall comply with all requirements of 29 CFR 1926 Subpart P 652 "Safety and Health Regulations for Construction – Excavations" and all Appendices related thereto.
 - c. Before commencing any trench excavation that will be five (5) feet deep or deeper, provide Owner, through A/E, with detailed plans and specifications regarding the safety systems to be utilized. Said plans and specifications shall include a certification from a registered professional engineer indicating full compliance with the 29 CFR 1926 Subpart P -- Excavations.
 - d. Contractor shall ascertain, prior to proposal, whether or not such conditions prevail and services are needed, and shall include cost of same in proposal.
- 2. All shoring and bracing shall be designed so that it is effective to the bottom of the excavation. Sheet piling, sheet piling, bracing, shoring, trench boxes, and other methods of protection, including sloping, shall be based upon the condition and nature of the materials to be retained, and by loads (including surcharge) imparted to the sides of excavation by equipment and stored materials.
 - 3. Store excavated or other materials a minimum of two feet (2') from the edge of any excavation. Retain such materials to prevent their falling or sliding into the excavation, and to prevent excessive pressure on the sides of the excavation.

4. Maintain sides and slopes of excavations in a safe condition by scaling, benching or barricading.
 5. Take other precautions via shoring and bracing to prevent slides or cave-ins. Take special precautions when trenches are located adjacent to backfilled excavations, or subjected to vibrations from railroads, highway traffic, operation of machines, etc.
- F. Verify locations of all existing utilities in the area prior to start of excavation (gas, electrical, water, sanitary, storm, telephone, cable TV, optical cable, etc.). Coordinate with utility companies as required.
1. Excavation within four feet (4') of existing utilities shall be done by hand digging only.
- G. Where conditions require concrete or other materials to be placed against undisturbed earth surfaces, any loosened or disturbed materials shall be removed from such surfaces.
- H. Trenching
1. Trenches shall be large enough to permit handling of pipe and accessories and making connections. Trench bottom width shall exceed bell or coupling diameters by at least twelve inches (12").
 2. Trenches in rock, soil containing rocks larger than two (2) inches in any dimension, and other non-uniform materials, shall be four (4) inches minimum and twelve inches (12") maximum below the bottom of the pipe to provide for a bedding course.
- I. Preparation of Trench Bottom
1. If the excavation is carried below the finished flow line grade of the pipe in order to remove unsuitable material or for any other reason, the trench shall be course bedded to within six inches (6") of the finished flow line grade of the pipe bottom with compacted load-bearing backfill. A bedding course as specified below shall then be placed over the load-bearing backfill.
 2. Trenches shall be dry when the trench bottom is prepared. A continuous trough with compacted bedding course shall be prepared to receive the bottom quadrant of the pipe barrel. Remove loose or disturbed material and bring the trench bottom up to grade with bedding material as follows:
 - a. Washed pea gravel with material no larger than 1/2 inch in largest dimension shall be utilized. Provide a minimum of 8" of bedding under all the pipe, fittings and valves.
 - b. Provide a Bentonite plug in the trench at the building perimeter where site drainage or other conditions could permit water intrusion into the trench under the building. Bentonite plug to extend 2 ft. on either side of the perimeter grade beam.
 3. In addition, for bell joint pipe, excavation for the bell or coupling shall be so that the pipe will bear on the trench bottom along the entire length of the barrel.
 4. Prepare the trench bottom carefully so that when placed in its final position, the pipe will be true to line and grade and uniformly supported.
- J. Laying Pipe
1. All pipe shall be clean at the time it is placed in the line. Open ends of pipe sections already in place shall be tightly plugged to prevent the entrance of trench water, mud, dirt, etc.
 2. Keep trench bottom free of frost, frozen earth or standing water at the time of pipe laying and jointing.

K. Compaction

1. Where compaction is indicated by specifications, accomplish same with vibratory or rammer type compactor, minimum of two full width passes.
2. Compaction below slabs, roads, flatwork, or other construction elements shall be performed to the requirements of compaction for those elements. Coordinate with general construction trades and other Division's specifications.

L. Backfilling

1. Clean trenches and backfill material of any organic material, roots, trash, lumber, other debris and frozen material prior to backfilling. Backfill material shall contain no organic material, roots, trash, lumber, other debris or frozen material. Backfill material under slabs inside building shall match adjacent materials and be of density acceptable to the A/E.
2. Backfilling by means of sluicing or flooding with water is not permitted. Backfill shall not be placed on frozen ground.
3. Partially backfill immediately after the pipe is laid (unless other methods for anchoring pipe are provided). Leave joints exposed for hydrostatic testing. Water shall not be permitted to rise in unbackfilled trenches after pipe has been placed.
4. Whenever timber or other sheeting is driven to a depth below the elevation of the top of the pipe, that portion of the sheeting below a point four feet above the elevation of the top of the pipe shall not be disturbed or removed.
5. Pipe layer backfill (bedding material under the bottom quadrant of the pipe, around sides, and up to a point one foot above the top of the pipe) shall be: sand or select material containing rocks no larger than 1/2 inch in greatest dimension (sand only shall be used with all plastic piping systems or plastic jacketed piping systems); except that pipe layer backfill below slabs in active soils shall be washed pea gravel of 1/2 inch minus dimensions. Backfill below slabs may utilize flowable fill.
6. Backfill material shall be placed and compacted in six inch (6") layers. Backfill shall be brought up evenly on both sides of the pipe simultaneously to avoid damage or displacement from unbalanced loading.
7. Joints shall not be covered with backfill until pressure and leak testing is completed.
8. Backfill to grade (above pipe layer).
 - a. Active Soils: Where active soils are encountered backfill to grade within ten (10) feet of building line shall be uncompacted washed pea gravel to match the pipe layer backfill specified above.

- M.** The Contractor shall also comply with requirements set forth in Division 31 Drawings and Specifications.

3.14 RIGGING

- A.** Design is based on application of available equipment. Openings in building structures are planned to accommodate design scheme.
- B.** Alternative methods of equipment delivery may be offered by Contractor and will be considered by Government under specified restrictions of phasing and maintenance of service as well as structural integrity of the building.
- C.** Close all openings in the building when not required for rigging operations to maintain proper environment in the facility for Owner operation and maintenance of service.

- D. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility.
- E. Contractor shall check all clearances, weight limitations and shall offer a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.
- F. Restore building to original condition upon completion of rigging work.

3.15 CLOSE OUT DOCUMENTATION AND TESTING REPORTS

- A. Contractor shall provide Project Record Documents, Operation and Maintenance data and all product warranty data as specified in Division 01.
- B. Contractor shall also provide copies of all plumbing system test and certification reports for inclusion in project close out documents. Reports shall include, but shall not be limited to, the following:
 - 1. Piping system pressure test reports (per Sections 22 11 00, 22 11 23, 22 13 00 and 22 14 00),
 - 2. Domestic water disinfection tests (per Section 22 11 00),
 - 3. Backflow prevention assembly certifications (per Section 22 11 00),
 - 4. Domestic hot water systems tests (per Section 22 11 00),
 - 5. Boiler certification (per Section 22 33 00 or 22 34 00), and
 - 6. Medical Gas system verification tests (per Section 22 60 13).

END OF SECTION

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment markers.
2. Valve tags.
3. Valve schedules.
4. Pipe markers.
5. Ceiling tacks.
6. Signs.

B. Related Sections:

1. Division 09 - Painting and Coating: Execution requirements for painting specified by this section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME A13.1 – Scheme for the Identification of Piping Systems.

B. American National Standards Institute:

1. ANSI Z535.1 – Safety Color Standard.
2. ANSI Z535.2 – Environmental and Facility Safety Signs.

C. National Fire Protection Association:

1. NFPA 99 – Health Care Facilities Code.

1.3 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit manufacturer's catalog literature for each product required.

C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification. Submit a valve chart and schedule, including valve tag number, location, function and valve manufacturer's name and model number.

D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.4 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.5 QUALITY ASSURANCE

- A. Conform to ASME A13.1 and ANSI Z535.1 for color scheme for identification of piping systems and accessories.
- B. Conform to ASME A13.1 for length of field and letter height for pipe markers.
- C. Conform to ANSI Z535.1 and ANSI Z535.2 for emergency operating information and warning signs.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years of experience.

PART 2 - PRODUCTS

2.1 PIPE MARKERS

- A. General: Conform to ASME A13.1 for background and letter colors, length of color field and letter height.
- B. Self-Adhesive Pipe Markers: Flexible, indoor/outdoor grade vinyl with factory-applied pressure-sensitive adhesive. Provide with minimum 1-1/2 inch wide banding tape.
- C. Mechanically Applied Pipe Markers:
 - 1. For pipes with an overall diameter up to 6 inches, including insulation, provide semi-rigid plastic wrap around pipe marker that extends 360 degrees around the pipe at each marker location. The semi-rigid marker should include the legend and a directional flow arrow. Pipe size shall also be on label of all insulated pipes. The marker shall be supplied as a pre-tensioned device and be equipped with a 1/2 inch strip of adhesive on the inside to further secure the marker in a permanent position on vertical locations.
 - 2. For pipes with an overall diameter greater than 6 inches, including insulation, provide a semi-rigid plastic strap-on pipe marker with a height no less than 3 times the letter height. The marker shall include a legend and a directional flow arrow. Pipe size shall also be on label of all insulated pipes. Markers to be installed indoors shall be supplied with no less than two nylon straps to secure the marker in place. Markers to be installed outdoors shall be supplied with stainless steel or aluminum strapping.

2.2 DIRECTIONAL ARROWS

- A. Flow Direction: Provide flow directional arrows either as part of pipe markers, banding tape or separately, attached to pipes.
 - 1. Conform to requirements for markers.
 - 2. Size to conform to ANSI A13.1 (1 inch wide minimum).

2.3 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
 - 1. Green: Plumbing valves.

2.4 PLASTIC EQUIPMENT MARKERS

- A. General: Provide laminated plastic equipment markers for all scheduled items of plumbing equipment installed indoors.
- B. Size: Size laminated plastic markers not less than one inch in height and three inches in length with engraved lettering white on black not less than 1/4 inch in height. For larger pieces of equipment, size markers 1-1/2 inch in height by 4-1/2 inches long, of 3/32 inch laminated plastic melamine with white on black lettering engraved not less than 1/16 inch deep and 1/2 inch high.
- C. Attachment: Attach nameplates with rivets, stainless steel screws or bolts. On equipment such as tanks and pumps which cannot be drilled or pierced, attach nameplates with brass chains and "S" hooks.
- D. For plumbing equipment installed above ceiling, provide 3/4 inch by 2-1/2 inches laminate tags attached with rivets to the ceiling grid below.

2.5 ALUMINUM EQUIPMENT MARKERS

- A. General: Provide aluminum equipment markers for all scheduled items of mechanical equipment installed outdoors. Aluminum markers shall have either engraved or laser etched lettering.
- B. Size: Size aluminum markers not less than 1 inch in height and 3 inches in length with lettering white on black background not less than 5/8 inch in height. For larger pieces of equipment, size markers not less than 2 inches in height by 6 inches long, with lettering not less than 1 inch in height.
- C. Attachment: Attach nameplates with rivets, stainless steel screws or bolts. On equipment such as tanks and pumps which cannot be drilled or pierced, attach nameplates with stainless steel chains and "S" hooks.

2.6 VALVE TAGS

- A. Materials: Provide indoor valve tags of solid brass with stamped or engraved lettering or numbers. Provide outdoor valve tags of aluminum with stamped or engraved lettering or numbers.
 - 1. Fill lettering and numbers with black paint.
 - 2. Lettering shall be not less than 1/4 inch in height.
 - 3. Numbers shall be not less than 1/2 inch in height.
- B. Attachment: For valve tags in mechanical rooms, provide with brass jack chain and "S" hook attachment. For all other indoor valve tags, provide with brass beaded chain attachment. For all outdoor valve tags, provide with stainless steel jack chain and "S" hook attachment.

2.7 ENGRAVED PLASTIC LAMINATE SIGNS

- A. General: Where indicated in other sections of the specifications, provide engraved instruction signs, warning signs, operational instructions or other signs designated.
- B. Emergency Operating Signs: For emergency operating instructions, provide engraved, laminate, melamine plastic, white on red, not less than 1/8 inch thick.
 - 1. Provide concise written instructions on the emergency operation of the device.
 - 2. Letters shall be not less than 5/16 inch in height, engraved 1/16 inch deep in block capital letters.
- C. Information and Warning Signs: Provide general information and warning signs of laminated, melamine plastic, not less than 1/8 inch thick, with white engraved lettering on black, with letters not less than 1/4 inch in height, block capitals.
- D. Attachment: Attach signs directly to the equipment with rivets, bolts or screws, if possible. Otherwise, attach signs with angle brackets, U-bolts, or metal plates held in place to piping with stainless steel draw-bands.
 - 1. Attachment with adhesives will not be permitted.
 - 2. Locate signs not less than 4 feet nor more than 6 feet above the operating floor, directly visible from an operating aisle.
 - 3. Locate signs to preclude damage during maintenance and repair or by operating traffic.

2.8 VALVE SCHEDULES AND FRAMES

- A. General: Provide valve schedules for all valves provided by Division 22.
- B. Schedules: Provide typed or machine printed schedules, one item per line, double spaced.
 - 1. Printing shall be black on 8-1/2-inch by 11-inch white paper. Paper shall be waterproof or laminated after printing.
 - 2. For each valve, list the valve number, location, size and use or operating function.
 - 3. Support schedules in full extruded aluminum frames with removable, non-yellowing, clear plastic faces.
 - 4. Screw or bolt schedules to equipment room walls where directed.
 - 5. Coordinate valve numbers with valve tags so that no two valves or scheduled devices have the same number.

PART 3 - EXECUTION

3.1 GENERAL

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Install identifying devices after completion of coverings and painting.
- C. Install labels with sufficient adhesive for permanent adhesion. For unfinished canvas covering, apply paint primer before applying labels.
- D. Every Backflow preventer Shall have a Phenolic Sign mounted above it that indicates the equipment served. If located in a separate room the sign shall identify what room the equipment is located

3.2 CONCEALED VALVES AND EQUIPMENT

- A. Equipment Above Ceilings: Provide valve tagging and identification to equipment located above ceilings, such as valves, trap primers and other items before the ceilings are installed.
- B. Finished Surfaces: Where identification is to be provided on surfaces which require insulation, painting and finishing, install identification after covering and painting is complete.
- C. Provide plastic nameplates adhered to the ceiling grid to locate valves, equipment, or sensors above T-bar type panel ceilings. Locate in corner of panel closest to equipment. Label with tag of equipment.

3.3 PIPING SYSTEM IDENTIFICATION

- A. Install pipe markers on all piping systems and include arrows to show the normal direction of flow. Where flow can be in both directions, arrows in both directions shall be displayed.
- B. Identify piping exposed to view and concealed by accessible ceilings, including hard ceilings provided with access panels. Identify piping outdoors, in crawlspaces, on roof, above grade and within parking structures. Only piping located within walls or inaccessible areas need not be identified.
- C. Identify the temperature of domestic hot water piping systems, i.e. "140°F HOT WATER."
- D. Locate pipe markers as follows:
 - 1. Every 15 feet on straight runs.
 - 2. At each valve and control device.
 - 3. At each branch or take-off. Provide flow arrows on the branch pipe as well as on the main on both sides of the branch.
 - 4. At any change in piping direction.
 - 5. Above and below every floor or roof penetration.
 - 6. On either side of every wall or partition. Ensure there is a minimum of one marker per pipe in every room.
 - 7. On either side of large obstructions, ductwork or equipment that piping passes above.
 - 8. At 5-foot intervals where piping is obscured by close proximity to walls or other pipes.
 - 9. Provide only one label per unit drain connection for condensate drain piping on roof.
- E. Install pipe markers so they are visible and legible from a normal standing position.
- F. Secure each end of self-adhesive pipe markers with a full wrap of banding tape of the same background color. Banding tape shall overlap itself a minimum of 3 inches.
- G. Provide mechanically applied pipe markers for all piping in mechanical rooms and outdoors.
- H. Install detectable underground warning tape 12 inches below finished grade, directly above buried pipe. If piping is buried more than 36 inches below finished grade, then provide an additional continuous length of tape buried 12 inches above the piping.

3.4 VALVE IDENTIFICATION

- A. General: Provide a valve tag on every valve, cock and control device in each piping system. Exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets,

convenience and lawn-watering hose bibs and shut-off valves at plumbing fixtures. List each tagged valve in valve schedule for each piping system. In existing buildings, coordinate valve tags and schedules such that no valve numbers are duplicated.

1. Tagging Schedule: Comply with requirements of "Valve Tags" and "Valve Schedules and Frames" paragraph.
- B. Install valve schedule frames and schedules in machine rooms where indicated or where directed.

3.5 PLUMBING EQUIPMENT IDENTIFICATION

- A. General: Install equipment markers on or near each major item of plumbing equipment. Provide signs for the following general categories of equipment and operational devices:
1. Main control and operating valves.
 2. Meters and gauges.
 3. Fuel-burning units including boilers and water heaters.
 4. Pumps, compressors and motor-driven units.
 5. Heat exchangers.
 6. Primary balancing valves.
 7. Packaged booster pump units.
 8. Tanks and pressure vessels.
 9. Filters and water treatment systems.
- B. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.

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3.6 COLOR AND IDENTIFICATION SCHEDULE

- A. Provide all pipe labels and lettering of colors listed below.

<u>FLUID SERVICE TYPE</u>	<u>PIPE MARKER LEGEND</u>	<u>PIPE MARKER BACKGROUND / LETTERING COLOR</u>	<u>VALVE TAG LETTERING</u>
Domestic Cold Water	COLD WATER	Green / White	CW
Domestic Hot Water - 110°F	110°F HOT WATER	Green / White	HW
Domestic Hot Water Recirculation - 110°F	110°F HOT WATER RETURN	Green / White	HWC
Domestic Hot Water - 115°F	115°F HOT WATER	Green / White	HW
Domestic Hot Water Recirculation - 115°F	115°F HOT WATER RETURN	Green / White	HWC

Domestic Hot Water - 140°F	140°F HOT WATER	Green / White	HW
Domestic Hot Water Recirculation - 140°F	140°F HOT WATER RETURN	Green / White	HWC
Sanitary Waste	SANITARY WASTE	Green / White	
Sanitary Vent	SANITARY VENT	Green / White	
Storm or Roof Drain	STORM DRAIN	Green / White	
Grease Waste	GREASE WASTE	Green / White	
Acid Waste	ACID WASTE	Orange / Black	
Acid Vent	ACID VENT	Orange / Black	
Softened Water	SOFT WATER	Green / White	SW
Deionized Water	DEIONIZED WATER	Green / White	DI
Natural Gas	NATURAL GAS	Yellow / Black	GAS
Propane Gas	PROPANE GAS	Yellow / Black	GAS
Compressed Air	COMPRESSED AIR	Blue / White	CA
Non-Potable Water	CAUTION: NON-POTABLE WATER, DO NOT DRINK	Purple / Yellow	NP
Reclaimed / Re-use Water	CAUTION: NON-POTABLE RECLAIMED WATER, DO NOT DRINK	Purple / Black	RC

B. For medical gas piping, provide pipe labels and lettering of colors of color listed below:

<u>FLUID SERVICE TYPE</u>	<u>PIPE MARKER LEGEND</u>	<u>PIPE MARKER BACKGROUND / LETTERING COLOR</u>	<u>VALVE TAG LETTERING</u>
Carbon Dioxide	CARBON DIOXIDE	Gray / White	CD
Carbon Dioxide 50 PSI	CARBON DIOXIDE 50 PSI	Gray / White	CD
Oxygen	OXYGEN	Green / White	O2
Oxygen 50 PSI	OXYGEN 50 PSI	Green / White	O2
Evacuation	EVAC	Purple / White	EV
Medical Evacuation	MEDICAL EVAC	Purple / White	EV
Waste Anesthetic Gas Disposal	WAGD	Purple / White	WAGD
Medical Vacuum	MEDICAL VACUUM	White / Black	MV
Laboratory Vacuum	LABORATORY VACUUM	White & Black Checker / Black	LV
Non-Medical Vacuum	NON MEDICAL VACUUM	White & Black Stripe / Black	VAC
Laboratory Air	LABORATORY AIR	White & Yellow Checker / Black	LA
Medical Air	MEDICAL AIR	Yellow / Black	MA
Medical Air 50 PSI	MEDICAL AIR 50 PSI	Yellow / Black	MA

Non-Medical Air	NON MEDICAL AIR	White & Yellow Stripe / Black	AIR
Instrument Air	INSTRUMENT AIR	Red / White	IA
Cyclopropane	CYCLOPROPANE	Orange / Black	CP
Helium	HELIUM	Brown / White	HE
Helium 50 PSI	HELIUM 50 PSI	Brown / White	HE
Nitrous Oxide	NITROUS OXIDE	Blue / White	N2O
Nitrous Oxide 50 PSI	NITROUS OXIDE 50 PSI	Blue / White	N2O
Nitrogen	NITROGEN	Black / White	N
Nitrogen 160 PSI	NITROGEN 160 PSI	Black / White	N

END OF SECTION

SECTION 22 11 00 - FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Domestic water piping, below grade.
2. Domestic water piping, above grade.
3. Valves.
4. Pipe hangers and supports.
5. Backflow preventers.

1.2 Related Sections:

1. Division 03 – Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
2. Division 07 – Firestopping: Product requirements for firestopping for placement by this section.
3. Division 08 – Access Doors and Frames: Product requirements for access doors for placement by this section.
4. Section 22 00 01 – General Plumbing Requirements.
5. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports for placement by this section.
6. Section 22 05 53 – Identification for Plumbing Piping and Equipment: Product requirements for pipe identification and valve tags for placement by this section.
7. Section 22 07 00 – Plumbing Insulation: Product and execution requirements for pipe insulation.
8. Section 26 05 03 – Equipment Wiring Connections: Execution requirements for electric connections to equipment specified by this section.

1.3 REFERENCES

A. American National Standards Institute:

1. ANSI Z21.22 – Relief Valves for Hot Water Supply Systems.
2. ANSI/NSF 61 – Drinking Water Components – Health Effects.
3. NSF/ANSI 14 – Plastic Piping System Components and Related Materials
4. NSF/ANSI/CAN 372 – Drinking Water System Components – Lead Content

B. American Society of Mechanical Engineers:

1. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
3. ASME B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes.
4. ASME B16.51 – Copper and Copper Alloy Press-Connect Pressure Fittings
5. ASME B31.9 – Building Services Piping.
6. ASME B40.1 – Gauges - Pressure Indicating Dial Type - Elastic Element.
7. ASME Section VIII – Boiler and Pressure Vessel Code - Pressure Vessels.
8. ASME Section IX – Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

C. American Society of Sanitary Engineering:

1. ASSE 1010 – Performance Requirements for Water Hammer Arresters.
2. ASSE 1011 – Performance Requirements for Hose Connection Vacuum Breakers.
3. ASSE 1012 – Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.
4. ASSE 1013 – Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
5. ASSE 1017 – Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems.
6. ASSE 1019 – Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.
7. ASSE 1070 – Performance Requests for Water Temperature Limiting Devices.

D. ASTM International:

1. ASTM A182 – Standard Specification for Forged or Rolled Alloy and Stainless-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
2. ASTM A269 – Standard Specification for Seamless and Welded Austenitic Stainless-Steel Tubing for General Service.
3. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes.
4. ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless-Steel Pipes.
5. ASTM B32 – Standard Specification for Solder Metal.
6. ASTM B42 – Standard Specification for Seamless Copper Pipe, Standard Sizes.
7. ASTM B75 – Standard Specification for Seamless Copper Tube
8. ASTM B88 – Standard Specification for Seamless Copper Water Tube.
9. ASTM B584 – Standard Specification for Copper Alloy Sand Castings for General Applications.
10. ASTM E1 – Standard Specification for ASTM Thermometers.
11. ASTM E77 – Standard Test Method for Inspection and Verification of Thermometers.
12. ASTM F708 – Standard Practice for Design and Installation of Rigid Pipe Hangers.
13. ASTM F1476 – Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
14. ASTM D2765 – Standard Test Method for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics
15. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
16. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
17. ASTM F3226 – Standard Specification for Metallic Press-Connect Fittings for Piping and Tubing Systems

E. American Welding Society:

1. AWS A5.8 – Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:

1. AWWA C651 – Disinfecting Water Mains.
2. AWWA C700 – Cold-Water Meters - Displacement Type, Bronze Main Case.
3. AWWA C701 – Cold-Water Meters - Turbine Type, for Customer Service.
4. AWWA C702 – Cold-Water Meters - Compound Type.
5. AWWA C706 – Direct-Reading, Remote-Registration Systems for Cold-Water Meters.

6. AWWA M6 – Water Meters – Selection, Installation, Testing and Maintenance.
7. AWWA M14 – Backflow Prevention and Cross-Connection Control.

G. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 – Pipe Hangers and Supports – Materials, Design and Manufacturer.
2. MSS SP 67 – Butterfly Valves.
3. MSS SP 69 – Pipe Hangers and Supports – Selection and Application.
4. MSS SP 70 – Cast Iron Gate Valves, Flanged and Threaded Ends.
5. MSS SP 71 – Cast Iron Swing Check Valves, Flanged and Threaded Ends.
6. MSS SP 78 – Cast Iron Plug Valves, Flanged and Threaded Ends.
7. MSS SP 80 – Bronze Gate, Globe, Angle and Check Valves.
8. MSS SP 85 – Cast Iron Globe & Angle Valves, Flanged and Threaded.
9. MSS SP 89 – Pipe Hangers and Supports – Fabrication and Installation Practices.
10. MSS SP 110 – Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

H. National Electrical Manufacturers Association:

1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

I. Plumbing and Drainage Institute:

1. PDI WH201 – Water Hammer Arrester Standard.

J. Plastic Pipe Institute

1. PPI TR-3 / 2007 – Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

K. Underwriters' Laboratories

1. ANSI/UL 263 – Standard Fire Tests of Building Construction and Materials

1.4 SUBMITTALS

A. Division 01 – Submittal Procedures: Submittal procedures.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings and accessories. Submit manufacturer's catalog information and pipe joining methods: Solder, primer and glue, brazing, etc.
2. Valves: Submit manufacturer's catalog information with valve data and ratings for each service.
3. Hangers and Supports: Submit manufacturer's catalog information including load capacity.
4. Domestic Water Specialties: Submit manufacturer's catalog information, component sizes, rough-in requirements, service sizes, and finishes.
5. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

- C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. Shop Drawings of water system.

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 – Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of valves and equipment.
- C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.
- D. Record actual locations of valves, etc. and prepare valve charts.
- E. Test reports and inspection certification for all systems listed herein.
- F. Provide a certificate of completion detailing the domestic water system chlorination procedure and all laboratory test results.
- G. Submit location of access panels which vary from quantities or locations indicated on Contract Drawings.
- H. Provide full written description of manufacturer's warranty.
- I. Backflow preventer test report.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years of documented experience.
- C. Backflow prevention assembly tester shall be licensed by the State of Texas.

1.7 QUALITY ASSURANCE

- A. All work shall be in accordance with Texas Commission on Environmental Quality (TCEQ) Chapter 290 – Public Drinking Water.
- B. All piping materials shall be manufactured and tested according to applicable ANSI, ASTM, ASME, AWWA and CISPI standards.
- C. Unless otherwise noted, all piping materials shall be domestically manufactured in the USA.
- D. Piping Systems Materials:

1. Note: Piping systems shall use consistent materials throughout each system. Materials for each piping system shall not be "mixed". Exception: where required due to above/below grade conditions; allowed due to inside building/outside building conditions; or where indicated by drawings or specifications.
 2. Note: Lead containing solders shall not be used at any place in any system.
 3. All domestic water piping, equipment, fittings, tanks, gauges, valves and all appurtenances shall be certified to ANSI/NSF 61.
- E. Manufacturer's name and pressure rating shall be permanently marked on valve body.
- F. The Contractor shall notify the manufacturer's representative prior to installing any copper press fittings. The Contractor shall obtain the representative's guidance in any unfamiliar installation procedures. The manufacturer's representative of copper press fittings shall conduct periodic inspections of the installation and shall report in writing to the Contractor and Owner of any observed deviations from manufacturer's recommended installation practices.
- G. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.
- H. All grooved joint couplings, fittings, flanges, valves, and specialties of the same type shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- I. Installer Qualifications:
1. Company shall have minimum three years documented experience specializing in performing the work of this section.
 2. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.
 3. All installers of copper press fittings shall be trained by the fitting manufacturer's appointed representative. Written notification of training shall be submitted to Owner prior to any installation.
 - a. Installers shall attend a manufacturer's installation training class as having been trained and qualified to join piping with press-connect fittings. On-site training and credentialing by manufacturer's representative is acceptable.
 - b. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of press-connect bronze, copper, carbon steel or stainless steel fittings.
 - c. Press-connect bronze, copper, carbon steel or stainless steel fittings shall be installed using proper tool, actuator, jaws, and rings as instructed by the manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Division 01 – Product Requirements: Product storage and handling requirements.
- B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.

- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- F. Store piping and equipment in a safe place, dry, enclosed, under cover in a well-ventilated area.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 – Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.11 WARRANTY

- A. Division 01 – Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish 3-year manufacturer warranty for domestic water piping.
- C. Furnish 5-year manufacturer warranty for the entire pump assembly package (i.e. pumps, motors, controllers, sensors, gauges, pipe, valves, unions and fittings, etc).

1.12 EXTRA MATERIALS

- A. Division 01 – Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish 1 packing kit for each size valve, 1 loose key for outside hose bibs, service kits for 1 pump seal for each pump model.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER PIPING – BELOW GRADE

- A. Copper Tubing: ASTM B88, Type K, annealed.
 - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
 - 2. Joints: Brazed, AWS A5.8, lead free, BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.
- B. Copper Tubing: ASTM B42, annealed.
 - 1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. or Braze, AWS A5.8 lead free, BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.
- C. Buried pressurized piping sizes 2" and smaller shall be type "K" soft copper. No joints shall be allowed below slab.

2.2 DOMESTIC WATER PIPING – ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. or Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F. Fittings for copper piping 4 inches and larger shall be brazed.
 - 3. Thread fitting: Pipe joint compound shall be lead free, non-toxic, low VOC and ANSI/NSF6/compliant. Temperature service range 10°F to 300°F.

2.3 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.
 - 2. Copper Piping: Class 150, bronze unions with [soldered] [brazed joints].
 - 3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
 - 2. Copper Piping: Class 150, slip-on bronze flanges.

2.4 BALL VALVES

- A. 2 inches and Smaller: MSS SP 110, 400 psi WOG two-piece bronze body, chrome-plated brass ball, full port, Teflon seats, blow-out proof stem, locking lever handle with balancing stops.
- B. 2 inches and Smaller: MSS SP 110, Class 150, bronze, two-piece body, chrome-plated bronze ball, full port, Teflon seats, blow-out proof stem, locking lever handle with balancing stops.
- C. Neck Extensions: Provide valves with extended round stem/necks where valves are installed in piping to be insulated. Stem/necks must permit operation of valve without damage to the insulation vapor barrier system. Nibco Nibseal or equal.

2.5 STRAINERS

- A. 2 inch and Smaller: Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- B. 2-1/2 inch to 4 inch: Class 125, flanged iron body, Y pattern with 1/16-inch stainless steel perforated screen.
- C. 5 inch and Larger: Class 125, flanged iron body, basket pattern with 1/8-inch stainless steel perforated screen.

2.6 BACKFLOW PREVENTERS

- A. All potable water systems shall be installed to prevent contamination from non-potable liquids, solids or gases through cross connection or any other connection to the system. Provide backflow prevention devices to serve all connections to non-potable water systems.
- B. Provide vacuum breakers for all elements or systems requiring vacuum breakers for code, function, and/or protection of equipment/systems. These locations shall include, but not necessarily be limited to service/janitor/mop sinks, etc.
- C. All backflow prevention devices and assemblies shall be tested and listed by University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC FCCC&HR) or other agency approved by Texas Commission on Environmental Quality (TCEQ).
- D. Backflow preventer types. Provide the correct backflow preventer for each hazard.
 - 1. Double check valve type backflow preventer valve assemblies shall prevent the reverse flow of polluted water from entering into the potable water supply. Double check valve backflow prevention devices shall be used at low hazard sources of contamination where no potential health risks exists.
 - 2. Reduced pressure zone (RPZ) type backflow preventer valve assemblies shall prevent the reverse flow of polluted water from entering into the potable water supply due to backsiphonage and or backpressure. Reduced pressure zone backflow prevention devices shall be used at high hazard sources of contamination where a potential health risk exists and for containment at the water service entrance.
- E. Reduced Pressure Backflow Preventers:
 - 1. Comply with ASSE 1013.
 - 2. Bronze body, with bronze internal parts and stainless-steel springs.
 - 3. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.
- F. Double Check Valve Assemblies: Comply with ASSE 1012; Bronze body with corrosion resistant internal parts and stainless-steel springs; two independently operating check valves with intermediate atmospheric vent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 – Administrative Requirements: Coordination and project conditions.
- B. Verify excavations are to required grade, dry and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.3 INSTALLATION – HANGERS AND SUPPORTS

- A. Install hangers and supports in accordance with Section 22 05 29. Provide non-metallic coatings or inserts on attachments for electrolytic protection where attachments are in direct contact with copper piping.

3.4 INSTALLATION – BURIED PIPING SYSTEMS

- A. Verify connection to utility piping system size, location and invert are as indicated on Drawings.
- B. Establish elevations of buried piping with not less than 24 inches of cover (36 inches below paved areas).
- C. Establish minimum separation from sanitary sewer piping in accordance with applicable plumbing code.
- D. Remove scale and dirt on inside of piping before assembly.
- E. Excavate pipe trench in accordance with Section 22 00 01.
- F. Install pipe to elevation as indicated on Drawings.
- G. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth; compact to 95 percent maximum density.
- H. Install pipe on prepared bedding.
- I. Route pipe in straight line.
- J. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- K. Install shutoff and drain valves at locations indicated on Drawings.
- L. Install plastic ribbon tape continuous buried 9 inches above pipe line.
- M. Install trace wire continuous over top of plastic pipe buried 9 inches above pipe line.
- N. Pipe Cover and Backfilling:
 - 1. Backfill trench in accordance with Section 22 00 01.
 - 2. Maintain optimum moisture content of fill material to attain required compaction density.
 - 3. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
 - 4. Do not use wheeled or tracked vehicles for tamping.

3.5 INSTALLATION – ABOVE GROUND PIPING

- A. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

- D. Group piping whenever practical at common elevations.
- E. Slope piping and arrange systems to drain at low points.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.
- H. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Division 08.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09.
- L. Install domestic water piping in accordance with ASME B31.9.
- M. Sleeve pipes passing through partitions, walls and floors. Refer to Section 22 05 29.
- N. Install unions downstream of valves and at equipment or apparatus connections.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- Q. Install gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- R. Install ball valves for throttling, bypass, or manual flow control services.
- S. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- T. Provide spring loaded check valves on discharge of water pumps.
- U. Provide flow controls in water circulating systems.
- V. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.
- W. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.
- X. Install water hammer arrestors complete with accessible isolation valve on hot and cold-water supply piping to each fixture or group of fixtures.
- Y. Utilize slow closing valves only. Do not install or allow quick closing valves.

3.6 PIPE JOINTS

- A. Welded: Beveling, spacing and other details shall conform to ASME B31.9 and AWS B2.1.
- B. Threaded: Treads shall conform to ASME B1.20. Joint compound shall be applied to male threads only and joints shall be made up so no more than three threads show. Coat exposed threads on steel pipe with joint compound for corrosion protection.
- C. Soldered: Solder joints shall be made in accordance with ASTM B828. The temperature of the joint during soldering shall not be raised above the maximum temperature limitation of the flux.

3.7 BACKFLOW PREVENTORS

- A. Backflow prevention devices and assemblies shall be installed in compliance with American Water Works Association Manual M-14 "Backflow Prevention," and the following:
 - 1. Devices and assemblies shall be located as shown on plans.
 - 2. The highest part of any device or assembly shall not be installed over 5 feet above the finish floor. There shall be a minimum of 12 inches clearance above the device/assembly.
 - 3. The lowest part of any double check backflow preventer assembly shall be installed a minimum of 12 inches above finish floor.
 - 4. The service side of any device/assembly shall have a minimum clearance of 24 inches from the outermost dimension.
 - 5. The non-service side of a double check backflow assembly shall have a minimum clearance of 4 inches from the outermost dimension.
 - 6. All backflow and/or back siphonage assemblies/devices shall be tested in accordance with the rules and regulations of Texas Commission on Environmental Quality and the utility supplying the domestic water before substantial completion inspection is requested.
 - 7. Final reports shall be submitted to local code/inspection authorities and to A/E and utility prior to scheduling Substantial Completion reviews by the A/E.
 - 8. Persons performing the test on backflow and/or back siphonage assemblies/devices shall meet the following requirements:
 - a. Licensed by the Texas Commission on Environmental Quality as a Backflow Prevention Assembly Technician, and
 - b. If required by the utility supplying the water, registered with the utility for testing backflow preventer assemblies.
 - c. Testing of backflow preventer assemblies serving fire protection systems shall be performed by a person or organization with a current certificate of registration from the State Fire Marshal as an independent fire protection sprinkler contractor (Registered Firm) under the direct supervision of a licensed Responsible Managing Employee (RME) as defined by Texas Insurance Code (TIC), Chapter 6003 (formerly Article 5.43-3), Fire Protection Sprinkler System Service and Installation and the Texas Administrative Code Title 28, Chapter 34, Subchapter G – Fire Sprinkler Rules.
 - 9. Label all backflow preventers to indicate the equipment that they are protecting and the location. For example, "Ice maker – RM 123". Provide a phenolic sign; fasten to the wall above the backflow preventer. Letters should be a minimum 1/2" tall.

3.8 FIELD QUALITY CONTROL

- A. Division 01 – Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.

3.9 CLEANING AND DISINFECTION

- A. Domestic Water Piping: Domestic cold water and hot water piping shall be thoroughly flushed, cleaned and disinfected in accordance with the appropriate procedure described in the latest edition of ANSI/AWWA C651 or as described in this section. Cold and hot domestic water piping shall be thoroughly flushed with potable water to remove all foreign particles. The piping shall then be sterilized by filling the systems with a solution of chlorine containing 50 PPM of chlorine this solution shall stay in the piping for a minimum period of 24 hours; or the piping shall be filled with a solution of chlorine containing 200PPM of chlorine and this solution shall stay in the piping for a minimum of 3 hours. During which time all valves shall be opened and closed several times in order that all parts of the valve shall be in contact with the solution. After the sterilization period, the system shall be drained and flushed with clean potable water until the residual chlorine content is not greater than 0.2 PPM.
- B. Bacteriological test shall be performed by a third-party testing lab hired by the contractor. SUBMIT testing lab qualification for review and approval by the Owner and A/E. The testing lab shall not have less than five (5) years experience with water testing.
- C. The above procedure shall be performed prior to final connections to utility or existing piping systems in the building to assure no chlorine or other contamination migrates into systems.
- D. Within one-week (7 days) days after cleaning is completed, submit written report signed by supervising craftsman and contractor principal certifying cleaning and sterilization was conducted as specified.
- E. Take samples no sooner than 24 hours after flushing, from at minimum of 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.
- F. The cleaning and disinfection of water lines shall not be done sooner than 3 weeks prior to owner occupancy. If it has been more than 3 weeks then the contractor shall, at his own expense, clean and disinfect the pipe again not sooner than 3 weeks before owner occupancy.

3.10 TESTING

- A. Each system installed under this contract shall be cleaned and tested to appropriate plumbing code for each particular application.
- B. Testing shall also include any additional requirements from the authority having jurisdiction.
- C. Equipment, material, power, and labor necessary for the cleaning, flushing, sterilization, inspection and testing of systems covered within this Specification Section shall be furnished by the Plumbing Contractor. All testing and inspection procedures shall be in accordance with Division 01 and Special Condition requirements of this Contract.
- D. For any requested inspection, the Contractor shall complete prior inspections and tests to ensure that items are ready for inspection and acceptance by the Owner and/or Architect/Engineer. The Contractor shall be responsible for any and all costs incurred by Owner and/or Owner representatives, including consultants, resulting from a review or inspection that was scheduled prematurely.
- E. The Contractor shall conduct the tests and the Owner's Construction Inspector will witness and approve the results.

- F. Verify systems are complete, flushed and clean prior to testing. Isolate all equipment subject to damage from test pressure. Test and inspect for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Piping being tested shall not leak nor show any loss in test pressure for duration specified.
- G. Leave piping uninsulated, uncovered and unconcealed until it has been tested and approved. Where any portion of piping system must be concealed before completion of entire system, the portion shall be tested separately as specified for the entire system prior to concealment. Contractor shall expose all untested covered or concealed piping.
- H. In cases of minor installation and repairs where specified water and/or air test procedures are deemed impractical, Contractor shall obtain written approval from Owner's Representative to perform alternate testing and inspection procedures. Alternate testing and inspection procedures for minor installation and repairs shall include visual evaluation of installed components by Owner's Representative during a simulation of use.
- I. The water utilized for tests shall be obtained from a potable source of supply.
- J. Prepare testing reports. If testing is performed in segments, submit separate report for each segment, complete with diagram or clear description of applicable portion of piping. After inspection has been approved or portions thereof, certify in writing the time, date, name and title of the persons reviewing the test. This shall also include the description of what portion of the system has been approved. Obtain approval signature by Owner's Representative. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job Site. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner's Representative before final payment is made.
- K. Gauges used for testing shall have increments as follows:
 - 1. Tests requiring a pressure of 10 psi or less shall utilize a testing gauge having increments of 0.10 psi or less.
 - 2. Tests requiring a pressure of greater than 10 psi but less than or equal to 100 psi shall utilize a testing gauge having increments of 1 psi or less.
 - 3. Tests requiring a pressure of greater than 100 psi shall utilize a testing gauge having increments of 2 psi or less.
- L. Separately test above and below ground piping.
- M. Do not introduce test water into piping systems when exposure to freezing temperatures is possible.
- N. Do not introduce test water into sections of piping located above existing sensitive areas and/or equipment that may be damaged or contaminated by water leakage. Coordinate with Owner's Representative to determine areas and/or equipment considered as being sensitive.
- O. Defective work or material shall be reworked and replaced, and inspection and test repeated. Repairs shall be made with new materials. Pipe dope, caulking, tape, dresser couplings, etc., shall not be used to correct deficiencies.
- P. The Contractor shall be responsible for cleaning up any leakage during flushing, testing, repairing and disinfecting to the original condition any building parts subjected to spills or leakage.

- Q. All backflow and/or back siphonage assemblies/devices shall be tested in accordance with the rules and regulations of Texas Commission on Environmental Quality and the utility supplying the domestic water before substantial completion inspection is requested.
1. Final reports shall be submitted to local code/inspection authorities and to A/E and utility prior to scheduling Substantial Completion reviews by the A/E.
 2. Persons performing the test on backflow and/or back siphonage assemblies/devices shall meet the following requirements:
 - a. Licensed by the Texas Commission on Environmental Quality as a Backflow Prevention Assembly Technician, and
 - b. If required by the utility supplying the water, registered with the utility for testing backflow preventer assemblies.
- R. Domestic hot water system:
1. Test Remote fixtures to determine hot water is available within 30 seconds. Provide a report and a drawing indicated fixtures tested and the duration of time to provide 110 °F.
 2. Record temperature at each return pump.
- S. Pressure test all water piping in accordance with the applicable plumbing code and local AHJ.
- T. All testing of pumps shall be by owner representative and a report shall be provided.
- U. Equipment, material, power, and labor necessary for the cleaning, flushing, sterilization, inspection and testing of systems covered within this Specification Section shall be furnished by the Plumbing Contractor. All testing and inspection procedures shall be in accordance with Division 01 and Special Condition requirements of this Contract.
- V. For any requested inspection, the Contractor shall complete prior inspections and tests to ensure that items are ready for inspection and acceptance by the Owner and/or Architect/Engineer. The Contractor shall be responsible for any and all costs incurred by Owner and/or Owner representatives, including consultants, resulting from a review or inspection that was scheduled prematurely.

END OF SECTION

SECTION 23 00 01 - BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic HVAC Requirements specifically applicable to Division 23 sections, in addition to Division 01 - General Requirements.

1.2 REFERENCES

- A. All references in Division 23 to code standards or other publications shall be the latest edition/version, unless noted otherwise.

1.3 PLANS

- A. These specifications are accompanied by plans indicating typical layouts, pipe and equipment location, etc. The plans and these specifications are complimentary each to the other and what is called for by one shall be as binding as if called for by both. Should there be a conflict between Drawings and specifications regarding a material shown or work described or detailed then the material of work having the greater value shall be provided.
- B. The plans as prepared are in general diagrammatic. The contractor shall carefully lay out his work at the site to conform to the architectural, mechanical, electrical and structural conditions to provide grading of piping, to avoid all obstructions and to conform to details of installation as shown on the plans and supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated satisfactorily operating installation. The General Contractor must coordinate the work of all trades. All necessary offsets in piping, fittings, etc. required to avoid interferences between piping, equipment, structural and architectural work are not shown but shall be furnished and installed by the Contractor without additional expense to the Owner.
- C. These specifications and plans accompanying same are intended to cover systems which will not interfere with the design of the building, which will fit into the available spaces, and which will ensure complete and satisfactory systems. Each contractor shall, therefore, carefully examine the plans and the building and shall be responsible for the proper fitting of his material and apparatus into the building.
- D. The size of mechanical and electrical equipment indicated on the plans is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space with the manufacturer's recommended clearances allocated for same on the plans. It shall be the Contractor's responsibility to furnish data to evidence that sufficient space can be provided for the installation of proposed equipment and that adequate access will exist for servicing and maintenance of equipment. Should changes become necessary during construction, the contractor shall make such necessary changes at his (the Contractor's) own expense.
- E. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention no later than ten (10) days prior to the bid date, unless specified otherwise in Division 01. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus or equipment.

1.4 CHANGES

- A. Any changes from the plans necessary to make this work conform to the building as it is constructed, to make this work fit the work of other trades or to make this work conform to the rules of city and municipal bodies having jurisdiction shall be made by this contractor at no additional cost to the Owner. However, no changes shall be made from the work described on the plans and these specifications except on written order from the Architect/Engineer.
- B. If any changes are required other than those mentioned above and the changes involve extra work on the part of the Contractor, no charges for this extra work shall be allowed unless authorized in advance of the work by a written order from the Owner and/or Architect/Engineer stating the charges to be made for the work.
- C. Proposed use of item or equipment other than that specified or indicated may require redesign of structure, partitions, foundations, piping, wiring, or other parts of mechanical, electrical, or architectural layout. Redesign, new drawings, and detailing required shall be prepared and submitted to Architect/Engineer for approval.
- D. Where approved deviation requires different quantity, size and arrangement of wiring, conduit, equipment, etc. from that specified or indicated, provide such items and all other additional equipment required by system at no additional cost to the Owner.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protection:
 - 1. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation.
 - 2. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 - 3. Place damaged equipment in first class, new operating condition or replace same as determined and directed by the Architect. In particular, insulation which becomes saturated will be rejected and must be removed from the job. Such repair or replacement shall be at no additional cost to the Owner.
 - 4. Protect interiors of new equipment, and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
 - 5. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
- B. Cleanliness of Piping and Equipment Systems:
 - 1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
 - 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
 - 3. Clean interior of all tanks prior to delivery for beneficial use by the Owner.
 - 4. Boilers shall be left clean following final internal inspection by the inspector.
 - 5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.6 EXISTING FACILITIES

- A. All piping, valves, fittings, switches, starters, conduit boxes and/or any other items of mechanical or electrical equipment which are not in service at the completion of this contract shall be removed, unless otherwise noted.
- B. Where an existing service to existing building requires disconnection to facilitate installation of this work, this Contractor shall include in his bid the cost of such disconnecting, re-routing and re-connecting. Where any existing facilities which are to remain occupied are affected by disconnection, re-routing or re-connection, then such disconnecting, re-connecting and re-routing shall be done in such a manner so as not to interrupt any service to the building. Satisfactory arrangements shall be made with local authorities and/or the various utility companies involved. The method of disconnecting, re-routing and re-connecting shall be as shown on the Drawings, or if not shown on the drawings, subject to the approval of the Architect and Owner.
- C. Unless noted otherwise, all equipment and material indicated or specified to be removed shall become the property of the Contractor.
- D. This Contractor shall carefully coordinate work in and around existing services and equipment and adjoining rooms to remodel areas. Coordinate shut-down, removal, capping, and turn-on of existing services with the Owner's facilities' department and general contractor to provide continuous (uninterrupted) service throughout the construction period. This Contractor shall refer to the architectural plans and specifications and thoroughly familiarize himself with the construction phasing in remodel areas before beginning work.
- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Maintain the interior of building at 50 degrees F minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean-up of construction and demolition debris on all floor surfaces and on all equipment being operated by the Owner.

1.7 SUBSTITUTIONS

- A. The materials, products and equipment described and specified establish a standard of quality, function, dimension and appearance to be met by any proposed substitutions.
- B. Reference Division 01 – Product Requirements.
- C. Substitution requests are only required where specific manufacturers are listed or scheduled.

1.8 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. The Contractor shall furnish copies of the manufacturer's literature and drawings describing all proposed equipment and materials indicated in the specifications. The proposed use of the exact equipment and materials specified shall not change this requirement of including literature describing the proposed equipment. Manufactured items proposed for use, whether specified or proposed for substitution, shall be the current, catalogued product of the manufacturer, and replacement parts shall be available.
- C. Manufacturer's regular catalog sheets will not be acceptable under this requirement unless they indicate completely all of the specification requirements. Where drawings cover several sizes or

types of construction they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submitted item with its respective specified item. Annotate to indicate exact model, size, and type submitted.

- D. Brochures shall contain a certification that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described and that approval is recommended. The certification shall be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required actions. Any deviation from the requirements of the specifications shall be clearly noted and marked for the Engineer's consideration.
- E. Approval of the brochures, or any part of the contents therein, shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called in writing to proposed deviations at the time of transmittal of the brochures and such deviations have been approved, nor shall it eliminate the requirements or the responsibilities, if there are errors of any sort in the data submitted.

1.9 INTERFERENCES AND COOPERATION

- A. The plans are generally diagrammatic and the Contractor shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work will be avoided. Not all offsets in piping etc., are shown. The Contractor shall cooperate with the General Contractor and all other contractors to coordinate their work to avoid interferences and delays and arrange all parts of the work to harmonize in service and appearance with all other parts.

1.10 MATERIALS AND WORKMANSHIP

- A. All materials shall be new, of the quality specified and free of any defects. Manufacturer's names are listed to establish a standard of quality and construction.
- B. The Contractor will be responsible for transportation of his materials to the job and for their storage and protection until the final acceptance of the job.
- C. Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds and all labor required for the safe and expeditious execution of his contract.

1.11 PERMITS AND INSPECTIONS

- A. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid for by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, state and municipal regulations and other authorities who may have lawful jurisdiction over the work being done.
- B. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling AHJ required inspections through the General Contractor to allow inspections to be performed without impeding the progress of construction. Generally, the Contractor shall plan for inspections to occur two (2) weeks prior to the scheduled concealment of work in the area of inspection.

1.12 ENGINEERING DESIGN TEAM OBSERVATIONS

- A. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling progress observations through the General Contractor to allow for the following observations to be performed without impeding the progress of construction. Generally, the Contractor shall plan for observations to occur two (2) weeks prior to the scheduled concealment of work in the area of observation.
- B. In general, observations for this project shall include but not be limited to:
 - 1. Utility Rough in: All in wall and above ceiling utilities, services and systems in place including cross bracing, supports, etc. (No sheetrock, ceiling tiles, or insulation).
 - 2. Substantial Completion: All surfaces complete, fixtures installed and trim-out complete.

1.13 EXAMINATION OF SITE

- A. All Contractors submitting proposals for this work shall first examine the site and all conditions thereon and therein. All proposals shall take into consideration conditions as may affect the work under this contract. They shall satisfy themselves as to existing grades and the actual formation, and soil conditions.
- B. Contractors shall verify all service locations, elevations, sizes, etc. No information given on the plans shall relieve the Contractor of this responsibility.
- C. Before starting work, the Contractor shall verify all associated existing systems, pipe, locations, and dimensions so that the new systems can be properly connected as indicated on the documents.

1.14 QUALITY ASSURANCE

- A. Perform Work in accordance with codes listed on the drawing sheets the local authority having jurisdiction (AHJ), and the Architect/Engineer. As the minimum standard for the level of quality, in all cases the greater quantity or better quality shall be the first consideration for the basis of an acceptable product or process. The local authority having jurisdiction, the Architect and the Engineer shall have the final authority on the approval and/or use of any product or process specified or submitted for substitution. The greater quality and/or value specified herein for the system(s) and various components and installation procedures shall take precedence over the minimum requirements of the herein before mentioned codes.
- B. Equipment and Components: Bear UL and FM label or marking.
- C. Welding Materials and Procedures: Perform to ASME Code.
- D. Valves: Bear UL/FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Piping: All piping installed on this project shall bear the complete ASTM and Manufacturer's marking. Labeling and identification requirements as required by ASTM. All installed piping 5'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed, to meet this requirement.

1.15 CONTROLS

- A. Where "automatic controls" are called for in the plans and specifications, all the control instruments, such as motorized valves, etc., shall be provided by the Contractor. The Drawings may show some power connections to controls equipment. However, if more power is required, then the Contractor shall provide this power.

1.16 UNIONS

- A. No unions are to be placed in any pipe in a location which will be concealed or inaccessible after completion of the building unless furnished with an access panel either as shown on the drawings or as specified herein. Unions must be installed on each side of all pieces of equipment such as heating/cooling equipment, coils, pumps, etc., so that such equipment may be readily disconnected in location that equipment can be disconnected and removed.

1.17 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers, and equipment. Locate piping, sleeves, inserts, hangers, and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- E. Interconnection of Instrumentation or Control Devices: Generally, electrical and pneumatic interconnections are not shown but must be provided.
- F. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- G. Electrical and Pneumatic Interconnection of Controls and Instruments: This is generally not shown but must be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Comply with NFPA-70.
- H. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- I. Work in Existing Building: Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric

drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to Cutting and Patching article in Part 3 of this section.

1.18 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities will generally require temporary installation or relocation of equipment and piping.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- C. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining in service.
- D. Temporary equipment shall be provided when required by the phasing or called for specifically on the plans. The contractor shall maintain and operate temporary equipment or new equipment operated during construction strategically to provide desired indoor air conditions or for "dust" control.
- E. Temporary filters shall be provided throughout the entire construction period if the systems are operational. The frequency of replacement shall be directly related to the amount of airborne debris during the particular phase of construction. Different areas in different phases of the construction may require different frequencies of temporary filter replacement.
- F. Contractor shall keep building sealed weather tight if HVAC is turned 'ON' prior to substantial completion.

1.19 MECHANICAL DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor. Such access shall be provided without additional cost or time to the Owner. Where work is in an operating facility, provide approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the facility.
- B. In an operating facility, maintain the operation, cleanliness and safety. The Owner's personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and facility operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of facility operation. Perform all flame cutting to maintain the fire safety integrity of this facility. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards.
- C. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.

- D. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from the property expeditiously and shall not be allowed to accumulate.
- E. At any time work is occurring when the building is occupied, avoid using tools that create excessive noise that might disrupt the building operations (e.g. concrete breaking equipment, excavating equipment, hammer drills, screw guns, etc.). Use other types of tools or schedule work to occur outside of normally occupied hours. Carefully plan water control for all coring and sawing operations to prevent damage and disruption of occupants.

1.20 INDOOR AIR QUALITY CONTROL

- A. All Adhesives, sealants, paints, coatings applied within the weatherproofed interior of the building shall comply with applicable VOC thresholds of SCAQMD 1113 and 1168.

PART 2 - PRODUCTS

2.1 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.2 ESCUTCHEONS AND PLATES

- A. Where pipes pass through ceilings or walls in finished spaces, install sectional plates or escutcheons to cover the annular opening between pipe and sleeve. Solid plates with set screws shall be used where the sectional plates will not stay in place or are not available in the required size, or where other individual specification section(s) require one piece or greater quality escutcheons or plates.
- B. Inside diameter of escutcheons shall fit around insulation and around pipe when not insulated; outside diameter shall cover sleeve. Secure escutcheons or plates to pipe or sleeve but not to insulation. All escutcheons shall be triple nickel-chromium plated brass, or type 316L stainless steel

2.3 INSULATION

- A. All insulation materials used inside the building on this project, including finishes and adhesives on the exterior surfaces of pipes and equipment shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as determined by an independent testing laboratory in accordance with NFPA 255 as required by NFPA 90A, unless noted otherwise acceptable.

2.4 ASBESTOS

- A. Materials containing asbestos are not permitted.
- B. If any asbestos-containing material is discovered or suspected, the contractor shall immediately cease any and all work in that area. Cover the exposed material in plastic containment without disturbing the exposed material and notify the Architect and the Owner's representative.
- C. Certify in writing that neither the Contractor nor any of Contractor's subcontractors or suppliers will supply any materials that contain any asbestos in any form for this Project.

PART 3 - EXECUTION

3.1 ACCESS PANELS

- A. All valves, traps, drains, cleanouts, equipment, etc., must be accessible. The Contractor shall, wherever required to service his installation, coordinate size and location of access panels with General Contractor. Refer to Division 08 – Access Doors and Frames.

3.2 FIRESTOPPING

- A. Firestopping: Unused slots, sleeves and other penetrations in floors, walls or other general construction shall be closed and sealed with an approved firestopping material.
 - 1. Reference Division 07 – Firestopping for appropriate firestopping material required for each wall rating and penetration size and type.
 - 2. Floor slots and openings shall be closed with 16 gauge galvanized steel sheet supported on 1-inch by 1-inch by 1/8-inch structural angle drilled or supported with powder-driven studs into the building structure. Firestop with a layer of silicone elastomer not less than 1-inch thick which completely fills the opening. The top surface of the silicone elastomer shall be approximately 1-inch below the finished floor slab.
 - 3. Openings in walls shall be closed with 16 gauge galvanized steel sheet securely attached at the midpoint of the wall thickness and firestopped on both sides of the steel sheet with not less than 1/8-inch thick layer of non-sagging silicone elastomer to fully cover the opening.
 - 4. Single or multiple pipes passing through walls and floors shall have the annular space between pipes or between pipes and structure filled with silicone elastomer to provide a rated firestop (rated to match the assembly) for floors and walls.
- B. Pipe: The annulus between exposed pipe and walls or floors in finished spaces shall be refilled, sealed and painted to match adjacent surfaces.
- C. Future Slots: Cap ends of sleeve and mark as future.

3.3 CUTTING AND PATCHING

- A. All cutting and patching of floors, walls and ceilings for installation of work covered in these sections will be done by the General Contractor.
- B. Where it becomes necessary to drill into or cut through any existing or completed floors, walls or ceilings to permit the installation of any work under this contract or to repair any defects that may appear up to the expiration of the guarantee, such cutting and patching shall be done by the General Contractor under the supervision of the Architect.
- C. No joists, beams, girders or columns shall be cut without first obtaining written permission from the Architect or Structural Engineer.
- D. Methods of cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations approved by the Architect/Engineer. Impact type equipment shall not be used except where specifically approved by the Architect/Engineer. Openings in precast concrete slabs for pipes, etc., shall be core drilled to exact size.
- E. Where core drilling or saw cutting of concrete floor or wall penetrations is required, work shall be performed in accordance with Division 03 Specifications. Where applicable Division 03

Specifications are not included in the Project, core drilling shall be in accordance with generally accepted standards and be performed by licensed personnel where applicable.

- F. Contractor shall use ground penetrating radar (GPR) to scan areas of concrete prior to core drilling or saw cutting for embedments. Contractor shall clearly mark locations of embedments for review by Structural Engineer or owner's construction representative before core drilling or saw cutting.
- G. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner approved by the Architect/Engineer.
- H. Plaster: All mechanical work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- I. All drilling methods for expansion bolts, hangers and other supports shall be done subject to be approval of the Architect or Structural Engineer. Labor and materials required to replace or rebuild parts or injured portions shall be furnished at the Contractor's expense, subject to the satisfaction of the Architect.
- J. Restoration: All openings shall be restored to "as new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.

3.4 PAINTING

- A. Types of paint shall be as specified in the Architectural specifications. Surfaces to be painted are identified in Division 09 and the drawings.
- B. All surfaces to be painted shall be thoroughly cleaned, all rust scraped off and all oil and grease removed before any paint is applied.
- C. Finishing paint coats shall not be applied until all the work is completed. Cloths shall be spread where necessary to prevent drops of paint, oil, etc. from defacing walls, floors, etc., and the Contractor shall be held responsible for all damage by neglect of such precautions. The finished conditions of the painting shall be subject to the approval of the Architect, who may require retouching or repainting of surfaces not properly finished.

3.5 CLOSE OUT DOCUMENTATION AND TESTING REPORTS

- A. Contractor shall provide Project Record Documents, Operation and Maintenance data and all product warranty data as specified in Division 01.
- B. Contractor shall also provide copies of all piping system test and certification reports for inclusion in project close out documents.

END OF SECTION

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Perform all Work required to provide and install supports, hangers, anchors, sleeves and bases for all plumbing piping, equipment, system components and accessories, indicated by the Contract Documents with all supplementary items necessary for complete, code compliant and approved installation.
- B. Section Includes:
 - 1. Hangers and supports.
 - 2. Accessories.
 - 3. Formed steel channel.
- C. Related Sections:
 - 1. Division 03 – Concrete Forming and Accessories: Execution requirements for placement of inserts or sleeves in concrete forms specified by this section.
 - 2. Division 03 – Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
 - 3. Division 07 – Firestopping: Product requirements for firestopping for placement by this section.
 - 4. Division 07 – Sheet Metal Flashing and Trim: Product and execution requirements for sheet metal flashing and trim for placement by this section.
 - 5. Division 07 – Joint Protection: Product requirements for sealant materials for placement by this section.
 - 6. Division 09 – Painting and Coating: Product and execution requirements for painting specified by this section.
 - 7. Section 23 05 48 – Vibration for HVAC Piping and Equipment: Product and execution requirements for vibration isolators.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.5 – Refrigeration Piping.
 - 2. ASME B31.9 – Building Services Piping.
- B. ASTM International:
 - 1. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E119 – Method for Fire Tests of Building Construction and Materials.
 - 3. ASTM E814 – Test Method of Fire Tests of Through Penetration Firestops.
 - 4. ASTM F708 – Standard Practice for Design and Installation of Rigid Pipe Hangers.
 - 5. ASTM E1966 – Standard Test Method for Fire-Resistive Joint Systems
- C. American Welding Society:
 - 1. AWS D1.1 – Structural Welding Code – Steel.

- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 58 – Pipe Hangers and Supports – Materials, Design and Manufacturer.
 - 2. MSS SP 69 – Pipe Hangers and Supports – Selection and Application.
 - 3. MSS SP 89 – Pipe Hangers and Supports – Fabrication and Installation Practices.
 - 4. MSS SP 90 – Guidelines on Terminology for Pipe Hangers and Supports.
- E. Underwriters Laboratories Inc.:
 - 1. UL 263 – Fire Tests of Building Construction and Materials.
 - 2. UL 723 – Tests for Surface Burning Characteristics of Building Materials.
 - 3. UL 1479 – Fire Tests of Through-Penetration Firestops.
 - 4. UL 2079 – Tests for Fire Resistance of Building Joint Systems.
 - 5. UL – Fire Resistance Directory

1.3 SUBMITTALS

- A. Division 01 – Submittal Procedures: Submittal procedures.
- B. Product Data: Submit manufacturer's catalog data including load capacity.
- C. Design Data: Indicate when requested, load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- D. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.
- E. Manufacturer's Installation Instructions: Submit special procedures and assembly of components.
- F. UL/FM assembly sheets or WH assembly sheets for fire rated penetrations.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years of documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum 3 years of documented experience.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Division 01 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical and damage, by storing in original packaging.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

- B. Contractor shall review all drawings, including structural drawings, for details regarding pipe supports, housekeeping pads, anchors, hangers, and guides.

1.7 WARRANTY

- A. Division 01 – Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Refer to individual system and equipment Specification Sections for additional support requirements. Comply with MSS SP-69 for support selections and applications that are not addressed within these Specifications.
- C. Utilize hangers and supports to support systems under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses from being introduced into the structure, piping or connected equipment.
- D. All pipe supports shall be of the type and arrangement to prevent excessive deflection, to avoid excessive bending stresses between supports, and to eliminate transmission of vibration.
- E. Design hangers to impede disengagement by movement of supported pipe.
- F. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.
- G. Wire or perforated strap iron will not be acceptable as hanger material.
- H. Hanger rods shall be threaded on both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.
- I. Fasteners requiring explosive powder (shooting) or pneumatic-driven actuation will not be acceptable under any circumstances.
- J. Nail drive anchors, plastic anchors or plastic expansion shields will not be permitted under any circumstances.
- K. Each hanger shall be properly sized to fit the supported pipe or fit the outside of the insulation on lines, hangers shall not penetrate insulation. Hangers shall bear on the outside of the insulation, which shall be protected by support shields as specified. For piping larger than 2", protect insulation from crushing by means of a section of rigid insulation to be installed at hanger points. Refer to Section 23 07 00.
- L. Hangers and clamps supporting and contacting individual non-insulated copper lines shall be copper or copper plated. Support individual non-insulated copper lines 4 inches and smaller with adjustable swivel ring hangers. Where non-insulated copper lines are supported on trapeze hangers or channels, the pipes shall be isolated from these supports with approved

flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp. Plastic tape is not acceptable.

- M. Field fabricated supports shall be constructed from ASTM A36/A36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- N. Provide adjustable spring type hangers/isolators on all pipe hangers on the first 15 feet of pipe entering the building and where piping offsets vertically from one floor level to another.
- O. Provide adjustable spring type vibration isolation hangers for piping connected to isolated equipment (i.e. pumps, etc.). Refer to Section 23 05 48.
- P. Finishes:
 - 1. All ferrous hangers, rods, inserts, clamps, stanchions, and brackets on piping within interior non-corrosive environments, shall be dipped in Zinc Chromate Primer before installation. Rods may be galvanized or cadmium plated after threading, in lieu of dipping zinc chromate.
 - 2. All hangers and supports exposed to the weather, including shall be galvanized or manufactured from materials that will not rust or corrode due to moisture. All hangers and supports located within corrosive environments shall be constructed from or coated with materials manufactured for installation within the particular environment.
- Q. Trapezes: Where multiple lines are run horizontally at the same elevation and grade, they may be supported on manufactured channel, suspended on rods or pipes. Trapeze members including suspension rods shall be properly sized for the quantity, diameters, and loaded weight of the lines they are to support.
- R. Vertical Piping:
 - 1. Supports for vertical riser piping in concealed areas shall utilize double bolt riser clamps, with each end having equal bearing on the building structure at each floor level.
 - 2. Supports for vertical riser piping at floor levels in exposed areas (such as piping in mechanical rooms) shall be attached to the underside of the penetrated structure utilizing drilled anchors, two hanger rods (sized as specified), and socket clamp with washers.
 - 3. Two-hole rigid pipe clamps or four-hole socket clamps with washers may be used to support pipe directly from adequate structural members where floor-to-floor distance exceeds required vertical support spacing and lines are not subject to expansion and contraction

2.2 HANGERS AND SUPPORTS

- A. Refrigerant Piping and Condensate Drain Piping:
 - 1. Conform to ASME B31.5, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods. At un-insulated piping provide clamp with a thermoplastic elastomer cushion insert similar to Unistrut's Cush-A-Clamp or equal.
 - 5. Wall Support: Steel channels with electro-galvanized clamps. At un-insulated piping provide clamp with a thermoplastic elastomer cushion insert similar to Unistrut's Cush-A-Clamp or equal.
 - 6. Vertical Support: Steel riser clamp.

7. Floor Support: Steel channels with electro-galvanized clamps. At un-insulated piping provide clamp with a thermoplastic elastomer cushion insert similar to Unistrut's Cush-A-Clamp or equal.
8. Copper Pipe Support: Copper-plated carbon-steel ring.

2.3 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded with adjusting and lock nuts.
- B. Pipe Shields: Provide pipe shields at each support location of insulated piping in accordance with insulation manufacturer's published recommendations. Install MSS SP-58, Type 39 protection shields, if insulation without vapor barrier is indicated. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier.
- C. Refer to Section 23 07 00 for addition data on insulation shields.
- D. Concrete Inserts:
 1. Cast in place concrete inserts shall comply with MSS SP 69, U.L. and F.M. standards and shall be sized to suit threaded hanger rods.
 2. Inserts shall have malleable iron case with galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
 3. Suitable concrete inserts for pipe and equipment hangers shall be set and properly located for all pipe and equipment to be suspended from concrete construction. If the inserts are later found not to be in the proper location for the placement of hangers, then drilled anchors shall be installed. Drilled anchors in concrete or masonry shall be submitted for the approval.
 4. Manufactured inserts for metal deck construction shall have legs custom fit to rest in form valleys.
 5. Shop fabricated inserts shall be submitted and approved by Owner prior to installation.
 6. Inserts shall be of a type that will not interfere with structural reinforcing and that will not displace excessive amounts of structural concrete.
- E. Power-actuated fasteners (shooting) will not be acceptable under any circumstances.
- F. Note: Under no circumstances will the use of plastic anchors or plastic expansion shields be permitted for any purpose whatsoever.

2.4 FLASHING

- A. Metal Flashing: 24 gauge thick galvanized steel.
- B. Metal Counterflashing: 24 gauge thick galvanized steel.
- C. Lead Flashing:
 1. Waterproofing: 5 lb./sq. ft. sheet lead.
 2. Soundproofing: 1 lb./sq. ft. sheet lead.
- D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gauge minimum; 16 gauge at fire-resistant elements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 – Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

3.2 PREPARATION

- A. Do not drill or cut structural members, unless written permission is obtained from the Structural Engineer.
- B. All auxiliary steel required for supports, anchors, guides, etc. shall be provided by the Contractor unless specifically indicated to be provided by others.
- C. All supports shall be of type and arrangement to prevent excessive deflection, to avoid excessive bending stresses between supports, and to eliminate transmission of vibration.
- D. Contractor shall be responsible for structural integrity of all supports, anchors, guides, etc. All structural hanging materials shall have a minimum safety factor of 5 built in

3.3 INSTALLATION – GENERAL

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. Application, sizing and installation of piping, supports, anchors and sleeves shall be in accordance with manufacturer's printed installation instructions.
- C. All supports shall be designed and installed to avoid interference with other piping, hangers, electrical conduit, supports, building structures, equipment, etc.
- D. All piping shall be installed with due regard to expansion and contraction and the type of hanger method of support, location of support, etc. shall be governed in part by this Specification.
- E. Install hanger so that rod is vertical under operating conditions.
- F. Provide for vertical adjustments after erection and during commissioning, where feasible, to ensure pipe is at design elevation and slope.
- G. Install hangers and supports to allow controlled thermal movement of piping systems, permitting freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Supports hangers, anchors, and guides shall be fastened to the structure only at such points where the structure is capable of restraining the forces in the piping system
- I. The load and spacing on each hanger and/or insert shall not exceed the safe allowable load for any component of the support system, including any concrete that holds the inserts. Reinforcement at inserts shall be provided as required to develop the strength required. Contractor shall be responsible for engaging a structural engineer as required for design and review at support systems.

- J. Do not hang pipe, duct or any mechanical item directly from a metal deck or locate on the bottom chord of any truss or joist unless approved by the Structural Engineer of Record.
- K. Piping and ductwork supports shall be independent from fire protection piping supports or supports for other trade. Combining supports is not permitted
- L. All piping and ductwork supports shall be designed and installed to allow the insulation to be continuous through the hangers.
- M. Adjustable clevis hangers shall be supported at rods with a nut above and below the hanger.
- N. All hanger rods shall be trimmed neatly so that 1 inch of excess hanger rod protrudes beyond the hanger nut. In the event a rod is intentionally but temporarily left excessively long (for sloped or insulated lines for example), the Contractor shall take appropriate measures to protect the pipe or other materials from damage.
- O. Install hangers to provide minimum ½ inch space between finished covering and adjacent structures, materials, etc.

3.4 INSTALLATION – PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.1, ASME B31.5, ASME 31.9, ASTM F708, MSS SP 58, MSS SP 69 and MSS SP 89.
- B. Support horizontal piping as scheduled at end of this section.
- C. Install hangers with a minimum 1/2 inch space between finished covering and adjacent work.
- D. Locate hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2-inch minimum vertical adjustment.
- F. Support vertical piping at every floor and at maximum 10' on center.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers or non-metallic coatings or inserts on attachments for electrolytic protection where attachments are in direct contact with copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat exposed steel hangers and supports. Refer to Division 09. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- L. Provide clearance in hangers and from structure and other equipment for installation of insulation.
- M. Insulated piping larger than 2" diameter shall be supported with inserts of the same thickness as the insulation, or with other approved methods. Refer to Section 23 07 00 – Piping Systems Insulation.

- N. Supports, hangers, anchors, and guides shall be fastened to the structure only at such points where the structure is capable of restraining the forces in the piping system.

3.5 INSTALLATION – ATTACHMENT TO STRUCTURE

- A. Hangers shall be attached to the structure as follows.

1. Poured-In-Place Concrete: Where pipes and equipment are supported under poured in place concrete construction, each hanger rod shall be fitted with a nut at its upper end, which nut shall be set into an Underwriters Laboratories, Inc. listed universal concrete insert placed in the form work before concrete is poured. Where inserts are placed in the bottom faces of concrete joists which are too narrow to provide adequate strength of concrete to hold the insert properly or where a larger insert would require displacement of the bottom joist steel, the hanger rod shall be suspended from the center of a horizontal angle iron, channel iron, I-beam, etc. spanning across two adjacent joists. The horizontal support shall be bolted to nonadjustable concrete inserts of the "spot" type, of physical size small enough to avoid the bottom joist steel.
2. Pre-Cast Tee Structural Concrete: Hanger supports, anchors, etc. required for mechanical systems attached to the precast, double tee, structural concrete system are to be installed in accord with approved shop Drawings only. Holes required for hanger rods shall be core drilled in the "flange" of the double tee only; impact type tools are not allowed under any circumstances. Core drilling in the "stem" portions of the double tee is not allowed. Holes core drilled through the "flange" for hanger rods shall be no greater than 1/4" larger than the diameter of the hanger rod. Hanger rods shall be supported by means of bearing plates of size and shape acceptable to the Architect/Engineer, with welded double nuts on the hanger rod above the bearing plate. Cinch anchors, lead shields, expansion bolts, and studs driven by explosion charges are not allowed under any circumstances in the lower 15" of each stem and in the "shadow" of the stem on the top side of the "double tees".
3. Steel Bar Joists: Where pipes and loads are supported under bar joists, hanger rods may be run through the space between the bottom angles and secured with a washer and two nuts. Where larger lines are supported beneath bar joists, hanger rods shall be secured to angle irons of adequate size; each angle shall span across two or more joists as required to distribute the weight properly and shall be welded to the joists or otherwise permanently fixed thereto.
4. Steel Beams: Where pipes and loads are supported under steel beams, approved type beam clamps shall be used.
5. Wood Framing: Where pipes and loads are supported from wood framing, hanger rods shall be attached to framing with side beam brackets or angle clips.

- B. Concrete Inserts.

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

- C. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.6 INSTALLATION – FLASHING

- A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide acoustical lead flashing around pipes penetrating equipment rooms for sound control.
- C. Provide curbs for roof installations. Flash and counter-flash with sheet metal; seal watertight. Attach Counterflashing to equipment and lap base flashing on roof curbs. Flatten and solder joints. Provide continuous shims under curbs as required to install equipment level.
- D. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb

3.7 FIELD QUALITY CONTROL

- A. Division 01 – Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.8 CLEANING

- A. Division 01 – Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

- A. Division 01 – Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

3.10 SCHEDULES

- A. Copper and Steel Pipe Hanger Spacing:

PIPE HANGER SPACING		
PIPE MATERIAL	MAXIMUM HANGER SPACING (Feet)	MIN. HANGER ROD DIAMETER (Inches)
Copper Tube, 1-1/4 inches and smaller	6	3/8
Copper Tube, 1-1/2 thru 2-1/2 inches	8	1/2
Copper Tube, 3 inches and larger	10	5/8
Steel Pipe, 1-1/2 inches and smaller	8	3/8
Steel Pipe, 2 thru 3 inches	10	1/2
Steel Pipe, 4 inches and larger	12	5/8

Support all vertical piping at each floor level and at maximum 10 feet spacing.

SECTION 23 05 48 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vibration isolators.
- B. Related Sections
 - 1. Division 03 - Cast-In-Place Concrete: Execution requirements for placement of isolators in floating floor slabs specified by this section and product requirements for concrete for placement by this section.
 - 2. Division 07 - Joint Protection: Product requirements for joint sealers specified for placement by this section.
 - 3. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports.

1.2 REFERENCES

- A. American Society of Heating, Refrigerating and Air Conditioning:
 - 1. ASHRAE 2019 HVAC Applications Handbook, Chapter 49.
- B. Sheet Metal and Air Conditioning Contractors' National Association:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit schedule of vibration isolator type with location and load on each. Submit catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance for standard sound attenuation products.
- C. Manufacturer's Installation Instructions: Submit special procedures and setting dimensions. Indicate installation requirements maintaining integrity of sound isolation.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of hangers including attachment points.

1.5 QUALITY ASSURANCE

- A. Provide for vibration isolation supports for all equipment, piping and ductwork indicated herein. The transmission of perceptible vibration to occupied areas by equipment installed under this Contract will not be permitted. Install vibration isolators as specified herein or shown on the

Drawings or otherwise required to prevent the transmission of vibration which would create objectionable noise levels in occupied areas.

- B. The vibration isolation supplier must be a firm capable of dealing effectively with vibration and noise characteristics effects and criteria; and one that can provide facilities and capabilities for measuring and evaluating the aforementioned disturbances.
- C. Provide vibration isolation devices, from a single manufacturer or supplier who will be responsible for complete coordination of all phases of this work.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Neoprene Pad Isolators - Type F:
 - 1. Rubber or neoprene-waffle pads.
 - a. 30 durometer.
 - b. Minimum 1/2 inch thick.
 - c. Maximum loading 40 psi.
 - d. Height of ribs: not to exceed 0.7 times width.
 - 2. Configuration: 1/2-inch-thick waffle pads bonded each side of 1/4 inch thick steel plate.
 - 3. For outdoor applications: provide material or coating that is UV-resistant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 – Administrative Requirements: Coordination and project conditions.
- B. Verify equipment and piping is installed before work in this section is started.

3.2 EXISTING WORK

- A. Provide access to existing piping and other installations remaining active and requiring access.

- B. Extend existing piping installations using materials and methods compatible with existing installations.

3.3 INSTALLATION

- A. Install isolation for motor driven equipment.
- B. Support piping connections to isolated equipment resiliently to nearest flexible pipe connector.
- C. Connect wiring to isolated equipment with flexible hanging loop.

3.4 FIELD QUALITY CONTROL

- A. Division 01 – Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect isolated equipment after installation and submit report. Include static deflections.

3.5 SCHEDULES

- A. Equipment Isolation Schedule:

Isolated Equipment	Base		Isolator	
	Type	Thickness	Type	Min. Deflection
Air-cooled Condensing Units	None	-	F	0.25 in.

END OF SECTION

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe Markers.
 - 2. Plastic Equipment Markers (Indoor Equipment).
 - 3. Aluminum Equipment Markers (Outdoor Equipment).
 - 4. Engraved Plastic-Laminate Signs.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME A13.1 – Scheme for the Identification of Piping Systems.
- B. American National Standards Institute:
 - 1. ANSI Z535.1 – Safety Color Standard.
 - 2. ANSI Z535.2 – Environmental and Facility Safety Signs.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit manufacturer's catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification. Submit a valve chart and schedule, including valve tag number, location, function and valve manufacturer's name and model number.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.5 QUALITY ASSURANCE

- A. Conform to ASME A13.1 and ANSI Z535.1 for color scheme for identification of piping systems and accessories.
- B. Conform to ASME A13.1 for length of field and letter height for pipe markers.
- C. Conform to ANSI Z535.1 and ANSI Z535.2 for emergency operating information and warning signs.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years of experience.

PART 2 - PRODUCTS

2.1 PIPE MARKERS

- A. General: Conform to ASME A13.1 for background and letter colors, length of color field and letter height.
- B. Self-Adhesive Pipe Markers: Flexible, indoor/outdoor grade vinyl with factory-applied pressure-sensitive adhesive. Provide with minimum 1-1/2 inch wide banding tape.
- C. Mechanically Applied Pipe Markers:
 - 1. For pipes with an overall diameter up to 6 inches, including insulation, provide semi-rigid plastic wrap around pipe marker that extends 360 degrees around the pipe at each marker location. The semi-rigid marker should include the legend and a directional flow arrow. Pipe size shall also be on label of all insulated pipes. The marker shall be supplied as a pre-tensioned device and be equipped with a 1/2 inch strip of adhesive on the inside to further secure the marker in a permanent position on vertical locations.
 - 2. For pipes with an overall diameter greater than 6 inches, including insulation, provide a semi-rigid plastic strap-on pipe marker with a height no less than 3 times the letter height. The marker shall include a legend and a directional flow arrow. Pipe size shall also be on label of all insulated pipes. Markers to be installed indoors shall be supplied with no less than two nylon straps to secure the marker in place. Markers to be installed outdoors shall be supplied with stainless steel or aluminum strapping.

2.2 PLASTIC EQUIPMENT MARKERS (INDOOR EQUIPMENT ONLY)

- A. General: Provide laminated plastic equipment markers for all scheduled items of mechanical equipment installed indoors.
- B. Size: Size laminated plastic markers not less than one inch in height and three inches in length with engraved lettering white on black not less than 1/4 inch in height. For larger pieces of equipment, size markers 1-1/2 inch in height by 4-1/2 inches long, of 3/32 inch laminated plastic melamine with white on black lettering engraved not less than 1/16 inch deep and 1/2 inch high.
- C. Attachment: Attach nameplates with rivets, stainless steel screws or bolts. On equipment such as tanks and pumps which cannot be drilled or pierced, attach nameplates with brass chains and "S" hooks.
- D. For HVAC equipment installed above ceiling, provide 3/4 inch by 2-1/2 inches laminate tags attached with adhesive to the ceiling grid below. All smoke dampers, fire dampers, VAV boxes, humidifiers, etc. shall be tagged.

2.3 ALUMINUM EQUIPMENT MARKERS (OUTDOOR EQUIPMENT)

- A. General: Provide aluminum equipment markers for all scheduled items of mechanical equipment installed outdoors. Aluminum markers shall have either engraved or laser etched lettering.
- B. Size: Size aluminum markers not less than 1 inch in height and 3 inches in length with lettering white on black background not less than 5/8 inch in height. For larger pieces of equipment, size

markers not less than 2 inches in height by 6 inches long, with lettering not less than 1 inch in height.

- C. Attachment: Attach nameplates with rivets, stainless steel screws or bolts. On equipment such as tanks and pumps which cannot be drilled or pierced, attach nameplates with stainless steel chains and "S" hooks.

2.4 ENGRAVED PLASTIC LAMINATE SIGNS

- A. General: Where indicated in other sections of the specifications, provide engraved instruction signs, warning signs, operational instructions or other signs designated.
- B. Emergency Operating Signs: For emergency instructions on air handler/fan start-stop or other emergency operating instructions, provide engraved, laminate, melamine plastic, white on red, not less than 1/8 inch thick.
 - 1. Provide concise written instructions on the emergency operation of the device.
 - 2. Letters shall be not less than 5/16 inch in height, engraved 1/16 inch deep in block capital letters.
- C. Information and Warning Signs: Provide general information and warning signs of laminated, melamine plastic, not less than 1/8 inch thick, with white engraved lettering on black, with letters not less than 1/4 inch in height, block capitals.
- D. Attachment: Attach signs directly to the equipment with rivets, bolts or screws, if possible. Otherwise, attach signs with angle brackets, U-bolts, or metal plates held in place to piping with stainless steel draw-bands.
 - 1. Attachment with adhesives will not be permitted.
 - 2. Locate signs not less than 4 feet nor more than 6 feet above the operating floor, directly visible from an operating aisle.
 - 3. Locate signs to preclude damage during maintenance and repair or by operating traffic.

PART 3 - EXECUTION

3.1 GENERAL

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Install identifying devices after completion of coverings and painting.
- C. Install labels with sufficient adhesive for permanent adhesion. For unfinished canvas covering, apply paint primer before applying labels.
- D. Identify control panels and major control components outside panels with plastic nameplates.

3.2 CONCEALED VALVES AND EQUIPMENT

- A. Identify air terminal units with plastic nameplates on the unit in clear view from below ceiling. Each air terminal unit box shall be labeled with its scheduled mark (i.e. VAV1-10, etc.).
- B. Equipment Above Ceilings: Provide valve tagging and identification to equipment located above ceilings, such as variable air volume boxes, valves, traps and other items before the ceilings are installed.

- C. Finished Surfaces: Where identification is to be provided on surfaces which require insulation, painting and finishing, install identification after covering and painting is complete.
- D. Provide plastic nameplates adhered to the ceiling grid to locate valves, equipment, or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment. Label with tag of equipment.

3.3 PIPING SYSTEM IDENTIFICATION

- A. Install pipe markers on all piping systems and include arrows to show the normal direction of flow. Where flow can be in both directions, arrows in both directions shall be displayed.
- B. Identify piping exposed to view and concealed by accessible ceilings, including hard ceilings provided with access panels. Identify piping outdoors, in crawlspaces, on roof, above grade and within parking structures. Only piping located within walls or inaccessible areas need not be identified.
- C. Locate pipe markers as follows:
 - 1. Every 15 feet on straight runs.
 - 2. At each valve and control device.
 - 3. At each branch or take-off. Provide flow arrows on the branch pipe as well as on the main on both sides of the branch.
 - 4. At any change in piping direction.
 - 5. Above and below every floor or roof penetration.
 - 6. On either side of every wall or partition. Ensure there is a minimum of one marker per pipe in every room.
 - 7. On either side of large obstructions, ductwork or equipment that piping passes above.
 - 8. At 5-foot intervals where piping is obscured by close proximity to walls or other pipes.
 - 9. Provide only one label per unit drain connection for condensate drain piping on roof.
- D. Install pipe markers so they are visible and legible from a normal standing position.
- E. Secure each end of self-adhesive pipe markers with a full wrap of banding tape of the same background color. Banding tape shall overlap itself a minimum of 3 inches.
- F. Provide mechanically applied pipe markers for all piping in mechanical rooms and outdoors.
- G. Install detectable underground warning tape 12 inches below finished grade, directly above buried pipe. If piping is buried more than 36 inches below finished grade, then provide an additional continuous length of tape buried 12 inches above the piping.

3.4 MECHANICAL EQUIPMENT IDENTIFICATION

- A. General: Install equipment markers on or near each major item of mechanical equipment. Provide signs for the following general categories of equipment and operational devices:
 - 1. Main control and operating valves.
 - 2. Meters and gauges.
 - 3. Fuel-burning units including boilers, furnaces, heaters, and absorption units.
 - 4. Pumps, compressors, chillers, condensers and motor-driven units.
 - 5. Heat exchangers, evaporators, cooling towers, and heat recovery units.
 - 6. Fans, blowers and primary balancing dampers.
 - 7. Packaged HVAC central-station units.
 - 8. Tanks and pressure vessels.

9. Filters, humidifiers and water treatment systems.

- B. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.

3.5 COLOR AND IDENTIFICATION SCHEDULE

- A. Provide all pipe labels and lettering of colors listed below:

<u>SERVICE TYPE</u>	<u>PIPE MARKER LEGEND</u>	<u>PIPE MARKER BACKGROUND / LETTERING COLOR</u>	<u>VALVE TAG LETTERING</u>
Condensate Drain	CONDENSATE DRAIN	Green/White	CD
Refrigerant Piping	REFRIGERANT PIPING	Yellow/Black	R
Natural Gas	NATURAL GAS	Yellow/Black	GAS
DVW Drain Piping	DRAIN	Green/White	SAN
DWV Vent Piping	VENT	Green/White	V

END OF SECTION

SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

1. Division 07 – Firestopping: Product requirements for firestopping for placement by this section.
2. Division 09 – Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.
3. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment: Product and Execution requirements for inserts at hanger locations.
4. Section 23 05 53 – Identification for HVAC Piping and Equipment: Product requirements for HVAC piping and equipment identification.
5. Section 23 21 13 – Hydronic Piping and Valves.

1.2 REFERENCES

A. ASTM International: D545

1. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
2. ASTM C165 – Standard Test Method for Measuring Compressive Properties of Thermal Insulation.
3. ASTM C177 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
4. ASTM C195 – Standard Specification for Mineral Fiber Thermal Insulating Cement.
5. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board.
6. ASTM C335 - Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation
7. ASTM C411 – Standard Test Method for Hot-Surface Performance of High Temperature Thermal Insulation.
8. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
9. ASTM C533 – Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
10. ASTM C534 – Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
11. ASTM C547 – Standard Specification for Mineral Fiber Pipe Insulation.
12. ASTM C552 – Standard Specification for Cellular Glass Thermal Insulation.
13. ASTM C553 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
14. ASTM C585 – Standard Practice for Inner and Outer Dimensions of Thermal Insulation for Nominal Sizes of Pipe and Tubing.
15. ASTM C591 – Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
16. ASTM C610 – Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
17. ASTM C795 – Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
18. ASTM C921 – Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
19. ASTM C1104 – Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

20. ASTM C1126 – Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
 21. ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 22. ASTM C1290 – Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 23. ASTM D1056 – Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.
 24. ASTM D2842 – Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 25. ASTM D5590 -- Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay.
 26. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
 27. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 28. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
 29. ASTM E1222 - Standard Test Method for Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems
 30. ASTM E2336 – Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems Acceptance Criteria for Grease Duct Enclosures
 31. ASTM F1249 -- Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
- B. International Code Council:
1. International Energy Conservation Code.
 2. International Mechanical Code.
- C. Sheet Metal and Air Conditioning Contractors':
1. SMACNA – HVAC Duct Construction Standard – Metal and Flexible.
- D. Green Seal Standard GS-11
1. GS-11 – Paints and Coatings (flat insulation coatings); Edition 3.2, October 2015.
 - a. Vapor Barrier Coatings: Maximum VOC content 50 g/L.
 - b. Weather Barrier Mastics: Maximum VOC content 50 g/L.
 - c. Lagging Adhesive/Coating: Maximum VOC content 50 g/L.
- E. Underwriters Laboratories:
1. UL 2818 – GREENGUARD Standard for Building Materials, Finishes and Furnishings.
 2. UL 2821 – GREENGUARD Test Method for Building Materials, Finishes and Furnishings.
- F. South Coast Air Quality Management District:
1. SCAQMD Rule 1168 – Adhesive and Sealant Applications, including all amendments through October 2017
 - a. PVC welding: Maximum VOC content 510 g/L.
 - b. Adhesive primer for plastic: Maximum VOC content 550 g/L.
 - c. Contact adhesive: Maximum VOC content 80 g/L.
 - d. Fiberglass adhesive: Maximum VOC content 80 g/L.
 - e. Insulation joint sealant: Maximum VOC content 420 g/L.
 - f. Other: Maximum VOC content 420 g/L.

1.3 SUBMITTALS

- A. Division 01 – Submittal Procedures: Submittal procedures.
- B. Product Data: Submit manufacturers published literature for each type of insulation. Data shall include product description, thermal characteristics, moisture absorption rating, flame spread and smoke developed ratings for each product.
- C. Submittal shall include a schedule indicating the following for each type of insulation:
 - 1. Pipe system
 - 2. Location (interior, exterior, mechanical room, etc.)
 - 3. Insulation and jacketing material
 - 4. Fitting insulation and jacketing material
 - 5. Pipe size range
 - 6. Insulation thickness
- D. Manufacturer's Installation Instructions: Submit manufacturer's published literature indicating proper installation procedures.

1.4 QUALITY ASSURANCE

- A. Products shall not contain formaldehyde, asbestos, lead, mercury, mercury compounds or polybrominated diphenyl ether fire retardants.
- B. Glass Fiber (Fiberglass) insulations shall have a minimum of 50% recycled glass content certified and UL environment validated.
- C. Glass Fiber (Fiberglass) insulations shall have a 100% bio-based, formaldehyde-free binder and shall be UL GREENGUARD Gold certified.
- D. All equipment, duct and piping insulation used within the interior portions of the building on the project must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50, as determined by test procedures ASTM E 84 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years of experience.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Division 01 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density, thermal ratings and thickness.

- C. Protect insulation from weather and construction traffic, dirt, water, chemical and damage, by storing in original wrapping.
- D. All materials delivered to the site shall be dry, undamaged and maintained in good condition throughout the progress of the project.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 – Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature during and after installation for minimum period of 24 hours.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 ADHESIVES, MASTICS AND SEALANTS

- A. All adhesives, mastics, sealants and coatings utilized for pipe and duct insulation shall have a maximum VOC content as specified in Part 1 of this Section.

2.2 PIPING AND EQUIPMENT - CELLULAR FOAM

- A. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.
 - 1. 'K' Value: ASTM C177 or C518; 0.28 at 75°F.
 - 2. Service Temperature: -40°F. to 220°F.
 - 3. Water Absorption: ASTM D1056; 1.0% by volume.
 - 4. Water Vapor Permeability: ASTM E96; 0.10 perms-inches.
 - 5. Maximum Flame Spread: ASTM E84; 25.
 - 6. Maximum Smoke Developed: ASTM E84; 50.
 - 7. Connection: Waterproof vapor barrier adhesive.
 - 8. GEI Greenguard indoor air quality certified for low chemical and particle emission.
- B. Elastomeric Foam Adhesive
 - 1. Air dried, contact adhesive, compatible with insulation.
 - a. Foster 85-75.
 - b. Childers CP-82.
 - c. Armacell 520.

2.3 PIPING - JACKETS

- A. Aluminum Jacket: ASTM B209.
 - 1. Thickness: 0.016 inch.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 mm thick die-shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
6. Metal Jacketing/Flashing Sealant: Sealing of seams to prevent water entry.
 - a. Foster 95-44.
 - b. Childers CP-76.

2.4 INSULATION SHIELDS AND INSERTS

A. Insulation Shields:

1. Application: All insulated piping, except for below grade direct buried piping.
2. Shields shall be made of galvanized steel or made of black iron painted on both sides with a minimum two coats of aluminum paint. Minimum metal shield sizes shall be as listed within the following table. Provide thicker/longer shields where recommended by insulation manufacturer's published product installation data:

Nominal IPS (inches)	Minimum Metal Thickness (gage)	Minimum Length (inches)
1/2 to 1-1/4	18	12
1-1/2 to 2	16	12
2-1/2 to 8	14	18
10	12	24

3. Provide MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier.
4. Depending on the type of pipe support design, stainless steel bands or aluminum bands may be required to keep shield material next to the jacketing material.
 - a. Insulation Bands: 3/4 inch wide; 0.007-inch-thick galvanized steel when exposed to interior environment, 0.010-inch-thick stainless steel or 0.015-inch-thick aluminum when exposed to humid interior environment or outside environment.
 - b. Metal Jacket Bands: 3/8 inch wide; 0.015-inch-thick aluminum or 0.010-inch-thick stainless steel to match jacket.

B. Insulation Inserts:

1. Application: All insulated piping larger than 2-inch diameter, except for below grade direct buried piping.
2. Inserts for shields shall be manufactured of corrosion resistant insulating material; cellular glass, phenolic or polyisocyanurate, of minimum 5.0 lb./cu. ft. density, suitable for the planned temperature range.
3. Inserts shall be the same thickness and contour as the adjacent insulation and shall be at least as long as the metal shield.
4. Factory fabricated inserts with integral galvanized pipe shields will be acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 – Administrative Requirements: Coordination and project conditions.
- B. Verify piping, equipment and ductwork has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.

3.2 COMMON INSULATION REQUIREMENTS

- A. Insulation shall not be installed until all testing and inspection of pipe, duct, vessel, etc. has been completed and approved by Engineer/Owner's representative.
- B. Replace insulation damaged by either moisture or other means. Insulation which has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also replace any materials damaged by the condensation.
- C. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- D. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- E. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- F. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- G. Install multiple layers of insulation with longitudinal and end seams staggered.
- H. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- I. Keep insulation materials dry during application and finishing.
- J. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- K. Install insulation with least number of joints practical.
- L. Install insulation continuously through hangers and sleeves and around anchor attachments.
- M. Where penetrating fire and/or smoke rated walls, partitions, barriers, or floors, provide UL-approved pipe and duct penetration assemblies that maintain the rating of the penetrated wall, partition, barrier, or floor.
- N. Insulation on all pipes or ducts is required to have a continuous vapor barrier. On all insulation with a vapor barrier, seal the joints, duct wrap seams, vapor retarder (ASJ) film seams and penetrations in insulation at hangers, supports, anchors, and other projections with a vapor-barrier coating/mastic as specified in the individual insulation sections.
 - 1. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier coating/mastic.
 - 2. Install insert materials and install insulation to tightly join the insert. Seal insulation to inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 3. Cover inserts with jacket material matching adjacent pipe insulation.

4. Install sheet metal shields over jacket at each hanger, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- O. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

3.3 PAINTING OF INSULATION

- A. Where indicated on the construction documents, paint duct or piping insulation in exposed areas, not including mechanical and equipment rooms. Do not paint insulation located in return air plenums.
- B. Prior to painting, wipe insulation jacket clean with a mild cleaning solution that will not leave a residue and allow to dry completely. Paint jacket with water based (latex) paint in accordance with manufacturer's recommendations and as required in the specification Division 09- Painting and Coating.

3.4 INSTALLATION – PIPE INSULATION

- A. Install materials in accordance with manufacturer's installation instructions and practices detailed by the North American Commercial and Industrial Insulation Standards manual (latest edition).
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Insulated pipes conveying fluids below ambient temperature:
 1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips sealed with vapor retarder mastic.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier coating or PVC covers.
- E. Insulated pipes conveying fluids above ambient temperature:
 1. Furnish factory-applied or field-applied standard jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips sealed with vapor retarder mastic.
 2. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and weather barrier breather mastic or PVC covers.
- F. Insulation Shields and Inserts:
 1. Application: Provide shields for all insulated piping, except for below grade direct buried piping. Provide insulation inserts for all piping or equipment larger than 2-inch diameter.
 2. Shields: Install between pipe hangers, pipe supports or pipe hanger rolls and inserts.
 3. Insert location: Install between support shield and piping and under finish jacket.
- G. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions and interruptions. Refer to Division 07 for penetrations of assemblies with fire resistance rating greater than one hour.

- H. Exterior Applications: Provide vapor retarder jacket. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover all exterior pipe insulation with aluminum jacketing.
- I. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size the insulation large enough to enclose pipe and heat tracing. Refer to Section 23 21 13 for heat tracing requirements.
- J. PVC or aluminum jacket: Install with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom of piping or equipment.

3.5 PIPING – CELLULAR FOAM INSULATION SCHEDULE

PIPING SYSTEMS		PIPE SIZE INCH	MIN INSTALLED THICKNESS INCH
A.	Condensate Drains	All	1"
B.	Refrigerant	1-1/4" & smaller	2"
		1-1/2" & larger	2"

END OF SECTION

SECTION 23 21 13 - HYDRONIC PIPING AND VALVES`

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Condensate drains.

B. Related Sections:

1. Division 07 – Firestopping: Product requirements for firestopping for placement by this section.
2. Division 08 – Access Doors and Frames: Product requirements for access doors for placement by this section.
3. Division 09 – Painting and Coating: Product requirements Painting for placement by this section.
4. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports, sleeves for placement by this section.
5. Section 23 05 48 – Vibration Controls for HVAC Piping and Equipment: Product requirements for Vibration Isolation for placement by this section.
6. Section 23 05 53 – Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.
7. Section 23 07 00 – HVAC Insulation: Product requirements for Piping Insulation for placement by this section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

B. ASTM International:

1. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A106 – Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
3. ASTM A234 – Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
4. ASTM A395 – Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
5. ASTM A536 – Standard Specification for Ductile Iron Castings.
6. ASTM B32 – Standard Specification for Solder Metal.
7. ASTM B88 – Standard Specification for Seamless Copper Water Tube.
8. ASTM B584 – Standard Specification for Copper Alloy Sand Castings for General Applications.
9. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
10. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

11. ASTM D2241 – Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
12. ASTM D2464 – Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
13. ASTM D2466 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
14. ASTM D2467 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
15. ASTM D2564 – Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
16. ASTM D2846 – Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
17. ASTM D2855 – Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
18. ASTM F437 – Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
19. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
20. ASTM F441 – Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
21. ASTM F493 – Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
22. ASTM F708 – Standard Practice for Design and Installation of Rigid Pipe Hangers.
23. ASTM F1476 – Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications

C. American Welding Society:

1. AWS A5.8 – Specification for Filler Metals for Brazing and Braze Welding.
2. AWS D1.1 – Structural Welding Code - Steel.

D. American Water Works Association:

1. AWWA C105 – American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
2. AWWA C110 – American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
3. AWWA C111 – American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151 – American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 – Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 67 – Butterfly Valves.
3. MSS SP 69 – Pipe Hangers and Supports - Selection and Application.
4. MSS SP 70 – Cast Iron Gate Valves, Flanged and Threaded Ends.
5. MSS SP 71 – Cast Iron Swing Check Valves, Flanged and Threaded Ends.
6. MSS SP 78 – Cast Iron Plug Valves, Flanged and Threaded Ends.
7. MSS SP 80 – Bronze Gate, Globe, Angle and Check Valves.
8. MSS SP 85 – Cast Iron Globe & Angle Valves, Flanged and Threaded.
9. MSS SP 89 – Pipe Hangers and Supports – Fabrication and Installation Practices.
10. MSS SP 110 – Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever joining dissimilar metals.
- B. Provide flanges, union, and/or couplings at locations requiring servicing. Use unions, flanges, and/or couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Provide pipe hangers and supports in accordance with Section 23 05 29, unless indicated otherwise.
- D. Use ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. Use ball valves for pipe sizes 2" and smaller. Use butterfly valves for pipe sizes 2-1/2" and larger.
- E. Use ball or butterfly valves for throttling, bypass, or manual flow control services, unless noted otherwise. Use ball valves for pipe sizes 2" and smaller. Use butterfly valves for pipe sizes 2-1/2" and larger.
- F. Ball valves for balancing shall have memory stops.
- G. Use spring loaded check valves on the discharge of pumps.
- H. Use 3/4-inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

1.4 SUBMITTALS

- A. Division 01 – Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate schematic layout of each piping system, including equipment, critical dimensions, and sizes.
- C. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
- D. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.
- E. Welders' Certificate: Include welders' certification of compliance with ASME Section IX.
- F. Test Reports: Indicate results of each piping system pressure test.

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 – Execution and Closeout Requirements: Closeout procedures.

- B. Project Record Documents: Record actual locations of piping, valves, equipment and accessories on as-built drawings during construction and transfer information to Record Document as directed in Division 01.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with applicable Mechanical Code including any local amendments.
- B. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- C. Perform Work in accordance with applicable authority for welding hanger and support attachments to building structure.
- D. Piping: All piping installed on this project shall bear the complete ASTM and manufacturer marking, labeling and identification requirements as required by ASTM. All installed piping 3'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed to meet these criteria. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 – Product Requirements: Product storage and handling requirements.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Protect stored piping, fittings and valves from entry of foreign materials. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation. If stored outdoors, elevate materials above grade.
- D. Protect installed piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 – Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.11 COORDINATION

- A. Division 01 – Administrative Requirements: Requirements for coordination.

1.12 WARRANTY

- A. Division 01 – Administrative Requirements: Requirements for Contractor warranty.
- B. For all grooved coupling piping, where specified and allowed, provide manufacturer's full 10-year warranty. Contractor shall coordinate with manufacturer for all training and supervision required to maintain this warranty.

PART 2 - PRODUCTS

2.1 CONDENSATE DRAINS

- A. Copper Tubing: ASTM B88, Type L hard drawn.
 - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
 - 2. Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. Solder joints shall be made in accordance with ASTM B828. The temperature of the joint during soldering shall not be raised above the maximum temperature limitation of the flux.
 - 3. Install a cleanout tee with threaded plug at changes of direction in condensate drain piping.
 - 4. Press fittings are not allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 – Administrative Requirements: Coordination and project conditions.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION

- A. General installation notes:
 - 1. Install piping in accordance with the applicable Mechanical Code including any local amendments, and ASME B31.9.
 - 2. Install in accordance with manufacturer's instructions.
 - 3. Route piping parallel to building structure, unless shown otherwise on drawings, and to maintain gradient.
 - 4. Space piping, including insulation, to provide one inch minimum clearance from adjacent piping or other surfaces. Increase pipe spacing as needed to account for grooved couplings and/or flanged fittings.
 - 5. Install piping to conserve building space, and not interfere with use of space.

6. Group piping whenever practical at common elevations.
 7. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 8. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- B. Hangers and supports: Install pipe hangers and supports in accordance with Section 23 05 29.
- C. Rated construction: Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Division 07.
- D. Pipe identification: Install pipe identification in accordance with Section 23 05 53.
- E. Access: Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Division 08.
- F. Insulation: Insulate piping as per Section 23 07 00.

3.4 FIELD QUALITY CONTROL

- A. Test piping systems in accordance with applicable Mechanical Code including any local amendments, and ASME B31.9. At a minimum the piping system shall be hydrostatically tested at one- and one-half times the maximum system design pressure, but not less than 150 psi. The duration of each test shall not be less than four hours.

END OF SECTION

SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant piping.
2. Unions, flanges and couplings.
3. Pipe hangers and supports.
4. Refrigerant moisture and liquid indicators.
5. Valves.
6. Refrigerant filter-driers.
7. Expansion valves.

B. Related Sections:

1. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.
2. Division 08 - Access Doors and Frames: Access doors for concealed valves and accessories.
3. Section 23 05 53 - Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.
4. Section 23 07 00 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.

1.2 REFERENCES

A. Air-Conditioning, Heating and Refrigeration Institute:

1. AHRI 710 - Liquid-Line Driers.
2. AHRI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter Dryers.
3. AHRI 750 - Thermostatic Refrigerant Expansion Valves.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 15 - Safety Code for Mechanical Refrigeration.

C. American Society of Mechanical Engineers:

1. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
2. ASME B31.5 - Refrigeration Piping.

D. ASTM International:

1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
2. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
3. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

E. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. International Mechanical Code.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.
- B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves or equipment.
- C. Provide pipe hangers and supports in accordance with ASME B31.5.

1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate layout of refrigeration piping system, including equipment, critical dimensions, and sizes.
- C. Product Data:
 1. Piping: Submit data on pipe materials, fittings and accessories.
 2. Valves: Submit manufacturer's catalog information with valve data and ratings for each service.
 3. Hangers and Supports: Submit manufacturer's catalog information including load capacity.
 4. Refrigerant Specialties: Submit manufacturer's catalog information including capacity, component sizes, rough-in requirements, and service sizes for the following:
 - a. Refrigerant moisture and liquid indicators.
 - b. Refrigerant filter-driers.

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of valves, equipment and refrigerant accessories.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components and exploded assembly views.
- D. Test Reports: Indicate results of refrigerant leak test.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.5 code for installation of refrigerant piping systems.
- B. Perform Work in accordance with the applicable code.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years of experience.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.
- C. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 COORDINATION

- A. Division 01 - Administrative Requirements: Requirements for coordination.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

- A. Copper Tubing: ASTM B280, Type ACR, drawn.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

2.2 UNIONS, FLANGES AND COUPLINGS

- A. 2 inches and Smaller:
 - 1. Copper Pipe: Bronze, brazed joints.

2.3 PIPE HANGERS AND SUPPORTS

- A. Conform to ASME B31.5.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Vertical Support: Steel riser clamp.

- E. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange.
- F. Copper Pipe Support: Carbon steel rings, adjustable, copper plated.
- G. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- H. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
- I. Sheet Lead: ASTM B749, 0.039 inch thick.

2.4 REFRIGERANT MOISTURE AND LIQUID INDICATORS

- A. Indicators:
 - 1. Port: Single, UL listed.
 - 2. Body: Brass, with solder ends.
 - 3. Sight glass: Color-coded moisture indicator and plastic cap.
 - 4. Maximum working pressure: 500psig.
 - 5. Maximum working temperature: 200 degrees F.

2.5 VALVES

- A. Service Valves:
 - 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, solder ends.
 - 2. Maximum working pressure: 500 psig.

2.6 REFRIGERANT FILTER-DRIERS

- A. Permanent Straight-Through Type:
 - 1. AHRI 710, UL listed, steel shell with molded desiccant filter core, for maximum working pressure of 500 psig.
 - 2. Rating: AHRI 730 flow capacity of nominal scheduled capacity served by line.

2.7 EXPANSION VALVES

- A. Provide with equipment. See equipment specification.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.

- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION – INSERTS

- A. Provide inserts for placement in concrete forms.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install hangers and supports in accordance with ASME B31.5.
- B. Support horizontal piping hangers as scheduled.
- C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Install hangers to allow 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
- G. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
- H. Provide sheet lead packing between hanger or support and piping.
- I. Prime coat exposed steel hangers and supports in accordance with Division 09. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

3.5 INSTALLATION – PIPING SYSTEMS

- A. Route piping parallel to building structure and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls and floors. Refer to Section 23 05 29.
- E. Install pipe identification in accordance with Section 23 05 53.

- F. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Division 08.
- H. Arrange refrigerant piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required per manufacturer's instructions. Slope horizontal piping 0.40 percent in direction of flow.
- I. Flood refrigerant piping system with nitrogen when brazing.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Insulate piping; refer to Section 23 07 00.
- M. Fully charge completed system with refrigerant after testing.
- N. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.
- O. Install refrigerant piping in accordance with ASME B31.5.

3.6 INSTALLATION – REFRIGERANT SPECIALTIES

- A. Refrigerant Liquid Indicators:
 - 1. Install line size liquid indicators in main liquid line downstream of condenser.
- B. Refrigerant Valves:
 - 1. Install service valves on compressor suction and discharge.
 - 2. Install gauge taps at compressor inlet and outlet.
- C. Filter-Driers:
 - 1. Install permanent filter-drier in systems containing hermetic compressors.

3.7 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and Division 01 - Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.
- B. Test refrigeration system in accordance with ASME B31.5.
- C. Pressure test refrigeration system with dry nitrogen to 500 psig.
- D. Repair leaks.
- E. Retest until no leaks are detected.

3.8 SCHEDULES

A. Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	MINIMUM HANGER ROD DIAMETER COPPER TUBING Inches
1/2	5	3/8
3/4	5	3/8
1	6	3/8
1-1/4	7	3/8
1-1/2	8	3/8
2	8	3/8
2-1/2	9	1/2
3	10	1/2
4	10	1/2
5	10	1/2
6	10	5/8

END OF SECTION

SECTION 26 00 01 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Basic Electrical Requirements specifically applicable to all Division 26 Sections, in addition to Division 1 - General Requirements.

1.2 OWNER-FURNISHED PRODUCTS

- A. Products furnished to the site and paid for by Owner:
 - 1. Where indicated on the Drawings or other sections of the specifications.

1.3 WORK SEQUENCE

- A. Install work in sequence to accommodate Owner's occupancy requirements during the construction period. Coordinate schedule and operations with Architect/Engineer and Owner.

1.4 BASIS OF BID

- A. The Bidders shall bid the work on the basis of the design presented on the Drawings and in the specifications. If in the opinion of the Bidder, the design will not be acceptable to the authorities having jurisdiction, he shall notify the Architect/Engineer, in writing, at least ten days prior to bid opening. After receipt of notice, and concurrence by the Architect/Engineer, changes to the design will be issued by addendum to all bidders of record.

1.5 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code, current edition with local amendments, if any.
- B. Applicable Building Code.
- C. All work installed under this contract shall comply with the requirements of the referenced standards.
- D. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, NEC, State and Municipal regulations, telephone company, power company and other authorities who may have lawful jurisdiction over the work being done.

1.6 SUBMITTALS

- A. Submit under provisions of Division 01 – Submittal Procedures.
- B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.
- C. Submit Shop Drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.

- D. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

1.7 REGULATORY REQUIREMENTS

- A. Conform to referenced codes.
- B. Obtain permits, and obtain all required inspections from authority having jurisdiction.
- C. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job.
- D. All Division 26 work shall be done under the supervision of a currently licensed State of Texas Master Electrician.

1.8 PROJECT/SITE CONDITIONS

- A. Contractor shall visit the site prior to bid and carefully familiarize himself with all existing conditions as may be determined by visual inspection without removing permanent finishes. If discrepancies are noted between the Drawings and existing conditions, the contractor shall notify the Architect/Engineer, in writing, no later than ten days prior to bid opening of the discrepancies. Upon receipt of notice of discrepancies, and verification, the Architect/Engineer will issue corrections by addendum to all bidders of record.
- B. Prepare Drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections.

1.9 QUALITY ASSURANCE

- A. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings or engineering parameters from those indicated on the contract documents, the contractor shall be responsible for all costs, including costs of all trades affected, involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.
- B. All materials, except medium voltage equipment and components, shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable and approved by Architect/Engineer, shall apply and such items shall bear those labels.

1.10 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Owner and by the Architect/Engineer Project Representative. The Owner may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- B. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

1.11 INTENT

- A. The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.
- B. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the Architect/Engineer's intent (as determined by the Architect/Engineer Project Manager).
- C. The details and Drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
- D. All sizes as given are minimum except as noted.
- E. Whenever a particular manufacturer's specific product is named, it is intended to establish a level of quality and performance requirements.

1.12 ENGINEERING DESIGN TEAM OBSERVATIONS

- A. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling progress observations through the General Contractor to allow for the following observations to be performed without impeding the progress of construction. Generally, the Contractor shall plan for observations to occur two (2) weeks prior to the scheduled concealment of work in the area of observation.
- B. In general, observations for this project shall include but not be limited to:
 - 1. Rough Wall: All utilities, services and systems in-place including wall studs, cross bracing, supports, etc. (No sheetrock or insulation).
 - 2. Corrected Rough Wall: (Before Sheetrock).
 - 3. Above Ceiling: All utilities, services and systems in place (ceiling grid/channels may be installed but no sheetrock or ceiling tile).
 - 4. Above Ceiling Final: All utilities, services and systems complete including hangers and labeling (ceiling grid and/or channel may be in place but no sheetrock or ceiling tile shall be installed).
 - 5. Substantial Completion: All surfaces complete, fixtures installed and trim-out complete.
 - 6. Final: Cleaned and ready for occupancy.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 SCOPE

- A. The accompanying Plans and Specifications as outlined in the various sections of this Division cover the furnishing of all labor, materials, tools, transportation services, etc., necessary for complete and working installation of electrical facilities.

3.2 EXISTING WORK

- A. Remove exposed abandoned equipment wiring connections, raceway systems, and cables, including those located above accessible ceiling finishes.
- B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not required to be removed.
- C. Extend existing equipment connections where indicated on the Drawings. Where existing circuits to remain are interrupted, replace interrupted portions to maintain continuity. Use materials and methods compatible with existing electrical installations and as specified.

3.3 FIRESTOPPING

- A. Unless specifically indicated otherwise on the Drawings, all penetrations of fire-rated walls and floors shall be made in accordance with specification Division 07.

3.4 TESTING

- A. General: Provide all labor, materials and equipment necessary to make the required tests as required by code or per other Division 26 sections.

3.5 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with provisions of Division 31. Blasting will not be allowed without written permission of the Architect/Engineer and Owner.

3.6 CONCRETE WORK

- A. All cast-in-place concrete unless noted otherwise elsewhere will be provided under Division 3. Provide all Layout Drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

3.7 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.8 EQUIPMENT ACCESS

- A. Install all piping, conduit, ductwork and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, provide the access doors.

3.9 COORDINATION

- A. Cooperate with other trades and Architect/Engineer's personnel in locating work. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the Project. The Contractor shall check location of electrical outlets with respect to other installations before installing.

- B. The Contractor shall verify that all devices are compatible for the surfaces in or on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.
- C. Coordinate all work with other trades prior to installation. Any installed work that is not coordinated and that interferes with other trades' work shall be removed without additional cost.

3.10 SLEEVES

- A. Pipe sleeves for conduits 6" in diameter and smaller, in new poured concrete construction, shall be schedule 40 steel pipe, plastic removable sleeve or sheet metal sleeve, all cast in place.
- B. In wet area floor penetrations, provide Schedule 40 sleeves only. Top of sleeve to be 2 inches above the adjacent floor. In existing wet area floor penetrations, core drill sleeve openings large enough to insert Schedule 40 sleeve and grout the area around the sleeve. If a pipe clamp resting on the sleeve supports the pipe penetrating the sleeve, weld a collar or struts to the sleeve that will transfer weight to the existing floor structure. Wet areas for this paragraph are rooms or spaces containing air handling unit coils, converters, pumps, chillers, boilers and similar waterside equipment.
- C. Pipe penetrations in existing concrete floors that are not in wet areas may omit the use of a core drilled opening without the sleeve, provided that the firestopping requirements of Article 3.02 are met.

3.11 HOUSEKEEPING AND CLEANUP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

END OF SECTION

SECTION 26 05 03 - EQUIPMENT WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. The work under this section includes electrical connections to equipment specified under other Divisions and/or Sections, or furnished by Owner, including, but not limited to:
 - 1. HVAC motors, controllers, and panels.
 - 2. Plumbing motors, controllers, and panels.
 - 3. Coolers and Freezers
 - 4. Kitchen Equipment
- B. Related Sections:
 - 1. Section 26 05 19 - Building Wire and Cable.
 - 2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA WD 1 - General Requirements for Wiring Devices.
 - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures.
- B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.
- C. Product Data: Submit wiring device manufacturer's catalog information showing dimensions, configurations and construction.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Submittal procedures.
- B. Project Record Documents: Record actual locations, sizes and configurations of equipment connections.

1.5 COORDINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- C. Determine connection locations and requirements.

- D. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- E. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 - PRODUCTS

2.1 CORD AND PLUGS

- A. Attachment Plug Construction: Conform to NEMA WD 1.
- B. Configuration: NEMA WD 6; match receptacle configuration with outlet furnished for equipment.
- C. Cord Construction: Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

2.2 RACEWAYS, BUILDING WIRE AND CABLE, AND ENCLOSED SWITCHES

- A. As specified in other Division 26 sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify equipment is ready for electrical connection, for wiring and to be energized.

3.2 INSTALLATION

- A. Make electrical connections. Utilize cord, receptacles and attachment plugs for portable equipment or for any equipment furnished by manufacturer with cord and plug connections. Install receptacle outlet to accommodate connection with attachment plug. Install cord and cap for field-supplied attachment plug. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes. Provide wire basket type strain reliefs, both ends for any suspended cords. Connect all other equipment with raceways and provide suitably rated disconnecting means, capable of being locked in the "off" position.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- E. Install terminal block jumpers to complete equipment wiring requirements.
- F. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements. Install in accordance with equipment vendor's requirements.

G. Coolers and Freezers:

1. Provide all 120V and above interconnecting wiring as required to provide a complete and working system.
2. Provide rigid conduit, IMC or PVC for all surface wiring in coolers and freezers. Whenever possible avoid the use of surface wiring and run conduit in space behind or above insulated panels.
3. Provide non-metallic nipple and sealing fittings whenever conduit pierces wall of cooler or freezer. Provide grounding conductor.
4. All openings cut in walls of cooler or freezer shall be patched and insulation integrity shall be maintained. Patching shall be approved by freezer or cooler installer.
5. Install all wiring for lighting, switches, evaporator, coil fans, compressors, interlocks, defrost heaters, door heaters, drain heaters, alarms or any other electric devices supplied with unit.
6. Seal all conduits entering and leaving temperature-controlled areas.

H. HVAC and Plumbing Connections:

1. Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.
2. VFD Installations: Install VFD input wiring and output wiring in separate conduit systems. Do not mix VFD input power and output power, or control wiring in a common raceway.
3. Provide 120 volts to each temperature control panel. Coordinate requirements with HVAC/DDC contractors.
4. Unless otherwise specified, all control devices such as aquastats, float and pressure switches, fan-powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired under other divisions of these specifications.
5. Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.
6. Check for proper rotation of each motor.

I. Kitchen Equipment Connections:

1. Check loose equipment delivered to job by equipment installer against approved Shop Drawings or other required Drawings. Connect loose electrical equipment including disconnects, starters, thermostats, controls, local and remote switches.
2. Contractor shall rough in for kitchen equipment only from approved kitchen equipment Shop Drawings.
3. Rough-in location shall be within three inches of equipment. If direct connection is required, use liquid-tight flexible conduit. If receptacle connection is required, verify proper receptacle configuration with equipment vendor.
4. Final connections shall include extension of all service to each piece of equipment. All labor and material required to completely connect the equipment ready to operate shall be included in the final connections. All control wiring not integral with equipment shall be included.
5. For kitchen exhaust hoods provide all required power and control wiring.

3.3 ADJUSTING

- A. Division 01 - Execution and Closeout Requirements: Testing, adjusting and balancing.**

- B. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

3.4 EQUIPMENT TO BE CONNECTED

- A. Unless specifically noted otherwise, each piece of utilization equipment shown on the Drawings, whether Owner furnished or Contractor furnished, shall be connected by the Contractor.

END OF SECTION

SECTION 26 05 05 - ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition for remodeling.
- B. Electrical/control portion of HVAC work covered by Division 23 pertaining electrical demolition shall follow the requirement set forth by this specification.

1.2 RELATED WORK

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for minor electrical demolition for remodeling.
 - 1. Section 26 00 00 - Basic Electrical Requirements.
- B. In the event of conflict regarding minor electrical demolition requirements between this Section and any other Section, the provisions of this Section shall govern.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: as specified in individual Sections.
- B. Provide all materials necessary for work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. All demolitions or modifications to existing systems shall be coordinated through Owner's Representative. Demolition Drawings are based on casual field observation and existing record documentations. Therefore, the accuracy or exactness of the Drawings is not guaranteed. The Contractor shall verify that field measurements and circuiting arrangements are as shown on Drawings and abandoned wiring and equipment serve only abandoned facilities. The Contractor shall be responsible for reporting discrepancies to Engineer before disturbing existing installation.
- B. Beginning of demolition means Contractor accepts existing conditions.

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal. Provide temporary wiring and connections to maintain remaining systems in service during demolition and/or modification. Owner reserve the right up to 24 hours prior to any scheduled event to delay or suspend shutdowns or outages to more convenient times at no additional cost.
- B. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. No work shall begin without proper permits and authorizations. Disable system only to make switchovers and connections. Obtain permission from Owner at least (2) weeks

before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

- C. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner at least (2) weeks before partially or completely disabling system. Minimize outage duration. Provisions for manual fire watch shall be provided in areas where services are interrupted. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new plan drawings.
- B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes full length from source to device. Cut embedded or concealed conduit flush with walls and floors, and patch surfaces.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- D. Disconnect and remove abandoned panelboards and distribution equipment.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers and other accessories.
- G. Repair adjacent construction and finishes damaged during demolition and extension work.
- H. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- I. Extend existing installations using materials and methods compatible with existing electrical installation or as specified.
- J. The level of completion shall be demonstrated to Owner's Representative.
- K. Where equipment is indicated to be demolished and returned to Owner, the Contractor shall include the delivery of this equipment to the Owner's site storage area. Remove with care all equipment to be relocated. Repair or replace of newly damaged equipment is the responsibility of the Contractor.

3.4 CLEANING AND REPAIR

- A. The Contractor shall follow Owner's clean work policy and shall include the removal of trash and demolished material from the building or work area at the end of each day and removal from the site once a week.
- B. The Contractor shall be responsible for repairing adjacent construction and finishes damaged during demolition and/or modification. The Contractor shall be responsible for the removal of ceiling tiles required in the demolition work. The Contractor shall be responsible for the replacement of damaged tiles and reinstallation of the ceiling prior to final acceptance.

- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.

3.5 DISPOSITION OF MATERIAL AND EQUIPMENT

- A. Review with the Owner materials that have been removed and are no longer required, to determine any which the Owner may desire to keep. Deliver those materials that the Owner desires to the Owner's specified location.
- B. For those materials not required by the Owner, dispose of them in accordance with applicable regulations.

END OF SECTION

SECTION 26 05 19 - 600-VOLT BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide a complete system of building wire and cable to all electrical loads.

1.2 REFERENCES

- A. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wire, cables, and connectors.
- B. UL Compliance: Comply with UL standards pertaining to wire cable and connectors.
- C. UL Labels: Provide electrical wires, cables and connectors which have been UL-listed and labeled.
- D. NEMA/ICEA Compliance: Comply with applicable portions of NEMA/Insulated Cable Engineers Association Standards pertaining to materials, construction and testing of wire and cable.
- E. ANSI/ASTM: Comply with applicable portions of ANSI/ASTM standards pertaining to construction of wire and cable.
- F. IEEE Compliance: Comply with applicable portions of IEEE standards pertaining to wire and cable.
- G. NECA Compliance: Comply with NECA's "Standard of Installation."

1.3 SYSTEM DESCRIPTION

- A. Conductors intended for power wiring and control wiring operating at above 50 volts to 600 volts nominal. Section includes both individual conductors and cable assemblies.

1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures: Requirements for submittals.
- B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.
- C. Product Data: Submit for building wire and each cable assembly type.

1.5 QUALIFICATIONS

- A. Manufacturers: Company supplying products listed by UL or CSA.
- B. Installer: Qualified with at least 5 years of successful installation experience on projects with electrical wiring work similar to that required for this project.

1.6 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All conductors shall be copper unless specifically noted or otherwise allowed in specifications or on Drawings. Conductor sizing shown on plans and schedules is based on copper unless specifically noted otherwise.
- B. All conductors shall be new, delivered to site in unbroken original packaging out of manufacturer's stock.
- C. Except as otherwise indicated, provide wire, cable and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, and as required for the installation.

2.2 CONDUCTORS

- A. Conductor: 600-volt copper in sizes #14 and larger.
 - 1. Conductors not smaller than #14 AWG for control circuits.
 - 2. Conductors not smaller than #12 AWG for power and lighting circuits.
 - 3. #10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet
 - 4. #10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 150 feet.
 - 5. All control wiring and motor connections shall utilize stranded conductors.
 - 6. Use stranded conductors for all feeders and branch circuits #10 AWG and larger.
 - 7. Wire sizes shown are minimum based on code requirements, voltage drop and/or other considerations. Larger sizes may be installed at the Contractor's option to utilize stock size, provided conduit sizes are increased where necessary to conform to the National Electrical Code. Sizes of wires and cables indicated or specified are American Wire Gage.
- B. Conductor: Aluminum conductors may be used where copper conductors are scheduled in sizes 1/0 or larger, under the following requirements:
 - 1. Aluminum alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 series alloy).
 - 2. The contractor shall increase the size of the raceways and enclosures, if necessary, to accommodate the aluminum conductors and meet applicable code requirements.
 - 3. The contractor shall increase the size of the aluminum conductor to match or exceed the ampacity of the copper conductor circuit shown on the Drawings.
 - 4. The contractor shall submit a feeder schedule to the Engineer for all conductor substitutions indicating the aluminum conductor wire size and the conduit size. The contractor shall not begin the installation until reviewed by the Engineer.
- C. Terminations:
 - 1. Split Bolt Connectors: Not Acceptable.
 - 2. Solderless Pressure Connectors: High copper alloy terminal. May be used only for conductor terminations to equipment pads or terminals. Not approved for splicing.

3. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
4. Compression (Crimp) Connectors: Long barrel; seamless, with internally beveled barrel ends. Connector shall be dual rated (AL7CU or AL9CU) and Listed by UL for use with aluminum and copper conductors, and sized to accept conductors of the required ampacity. Connectors shall be marked with wire size, die index, number and location of crimps and shall be suitably color-coded. Using a suitable stripping tool, remove insulation from the required length of the conductor. Crimp the connection per the connector manufacturer's recommendation.
5. Mechanical Connectors: For use on copper conductors only. Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances, unless otherwise noted specifically on plans.
6. When terminating conductors to plated bus, prepare a compression-type connection. Bolts shall be plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to current ASTM standard or SAE grade 5. Nuts shall conform to current ANSI standards. Washers shall be steel, Type A plain, standard wide series conforming to current ANSI standards. Belleville conical spring washers shall be of hardened steel, cadmium plated or silicone bronze. Lubricate and tighten the hardware per manufacturer's recommendations.
7. Conductor Termination: Provide all power and control conductors that terminate on equipment or terminal strips, with solderless lugs or fork and flanged tongue terminals.
8. Underground Connectors: All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.
9. All aluminum conductors shall terminate on a compression-type connector, IlSCO series or equal, or listed copper pigtail type adapters only. Wire brush the conductor and apply a Listed joint compound. Wipe off any excess joint compound after crimping.

2.3 BUILDING WIRE

- A. Product Description: Single conductor insulated wire.
- B. Insulation Types and Permitted Uses in Raceway for feeders and branch circuits:
 1. Concealed, Dry, Interior Locations: Type THHN/THWN, XHHW.
 2. Damp, Wet, Exterior Locations: Type THWN-2, XHHW-2.
 3. Aluminum: Type XHHW-2.
 4. Isolation Panels: Type XHHW.
- C. Conduit sizes are based on THHN wire.

2.4 METAL-CLAD CABLE

- A. Product Description: NEC Type 'MC' Metal Clad Cable. A fabricated assembly of insulated conductors in a flexible metallic enclosure. With an insulated green grounding conductor
- B. Armor Material per NEC 330.116
- C. Home Runs: All home runs shall be in conduit.

D. Uses Permitted:

1. Light fixtures: 6 foot maximum from individual light fixture to accessible junction boxes only.
2. Branch circuits only.
3. Dry interior locations only.
4. Use of cable only allowed from concealed devices in wall to junction box above ceiling and on wall directly above device.

E. Uses Restricted:

1. Exposed cable installation.
2. Direct connections between light fixtures.

2.5 WIRE COLOR

A. General

1. Provide color coding in accordance with local code or Owner's established requirements. If not governed by local code requirements, verify with Owner if any special requirements apply. If not, provide colors for branch circuits and feeders as follows:

	Wire Sizes #10 and Smaller: Use Continuous Color Coded Insulation (Note A.2.)				Wire Sizes #6 and Smaller: Use Continuous Color Coded Insulation (Note A.3.)	
System/Phase	A	B	C	N	G	IG
120/208	Black	Red	Blue	White	Green	Green/Yellow Stripe
120/240	Black	Orange	Blue	White w/color stripe (Note 03)	Green	Green/Yellow Stripe
277/480	Brown	Orange (Purple if Orange is utilized for hi-leg system)	Yellow	Gray	Green	Green/Yellow Stripe

2. For wire sizes 8 AWG and larger, identify black conductors with colored tape at terminals, splices and boxes; colors as noted above.
3. For wire sizes 4 AWG and larger, identify black conductors with green colored tape at terminals, splices and boxes; colors as noted above.
4. Provide white (no stripe) insulation when 120/208V system is not present at this installation.

B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number and provide color coding at each junction box containing more than one neutral.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

- E. Ground Conductors:
 - 1. For 6 AWG and smaller: Green.
 - 2. For 4 AWG and larger: identify with green tape at both ends and visible points including junction boxes.

2.6 MISCELLANEOUS ACCESSORY MATERIALS

- A. Conductor Phase Marking Tape:
 - 1. Furnish materials in accordance with referenced standards and authority having jurisdiction.
 - 2. Tape: Colored adhesive tape, equal to 3M Type 35.
- B. Wire Markers
 - 1. Furnish materials in accordance with referenced standards and authority having jurisdiction.
 - 2. Description: Split sleeve type wire markers.
 - 3. Legend:
 - a. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams.
- C. Cable Pulling Lubricant
 - 1. Products: Ideal 'Yellow 77+' or equal
- D. Aluminum Joint Termination Compound
 - 1. Products: ALNOX or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify interior of building has been protected from weather.
- C. Verify mechanical work likely to damage wire and cable has been completed.
- D. Verify raceway installation is complete and supported.
- E. Verify field measurements are as indicated on Drawings.

3.2 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required to meet project conditions.
- B. Wire and cable routing is approximate unless dimensioned.

3.3 EXISTING WORK

- A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.
- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.
- C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.
- D. Extend existing circuits using materials and methods compatible with existing electrical installations, and as specified.

3.4 INSTALLATION

- A. All wiring shall be installed as individual conductors contained in raceway systems, unless specifically noted otherwise on the Drawings or otherwise specified. Cables are not raceways.
- B. Provide separate neutral conductors for all single phase circuits. The use of multi-wire circuits with common neutrals is not allowed.
- C. Neatly train and lace wiring inside boxes, equipment and panelboards.
- D. Special Techniques – Building Wire in Raceway:
 - 1. Pull conductors into raceway at same time.
 - 2. Install building wire 1/0 AWG and larger with motorized pulling equipment.
 - 3. Use Listed wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary. Compound must not deteriorate conductor insulation.
 - 4. Place all conductors of a given circuit in the same raceway. This includes phase wires, neutral (if any), and ground conductor. If parallel phase and/or neutral wires are used, place an equal number of phase and neutral conductors in same raceway.
 - 5. Maintain equal lengths on all parallel conductors.
 - 6. Wire shall not be installed in raceways until the concrete work and plastering is completed and all conduits in which moisture has collected have been swabbed out. Insulation resistance to ground shall not be less than that approved by NEC. Eliminate splices wherever possible.
- E. Special Techniques – Types MC Cable:
 - 1. Protect exposed cable from damage.
 - 2. Support cable, spacing not exceeding (3) feet and at each junction box.
 - 3. Support cables above accessible ceiling, using spring metal clips to support cables from structure. Supporting methods utilizing either ceiling support or dedicated hanger wires are not acceptable. Do not rest cable on ceiling panels.
 - 4. Use insulated throat fittings and connectors.
 - 5. Each cable shall be supplied by only one (1) branch circuit breaker (one, two or three poles).
- F. Special Techniques - Direct Burial Cable:

1. Trench and backfill for direct burial cable installation. Refer to Section 31 23 23 and Section 31 23 17. Install warning tape along entire length of direct burial cable, within 6 inches of grade.
2. Use suitable direct burial cable fittings and connectors.

G. Special Techniques - Wiring Connections:

1. Clean conductor surfaces before installing lugs and connectors.
2. Conductors shall be continuous and no splices shall be made except within accessible junction boxes.
3. Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise.
4. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
5. Tape splices and joints with vinyl plastic tape. Use sufficient tape to secure insulation strength equal to that of the conductors joined.
6. Split bolt connectors are unacceptable for any purpose. Listed compression type connectors installed with compatible tooling may be used. Utilize manufacturer's preformed insulating devices when available and listed for use with installed connection.
7. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
8. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
9. Install suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

H. Do not place stranded conductors directly under wiring device screws.

I. Conductor Phase Marking Tape:

1. Install to identify phasing on all conductors #8 and larger, at each termination and in junction boxes, gutters and pull boxes.

J. Wire Marker Installation:

1. Install wire marker for each conductor at equipment cabinets, pull boxes, outlet and junction boxes.

3.5 FIELD QUALITY CONTROL

A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.

B. Provide visual and mechanical inspections on all conductors 1/0 AWG and larger as follows:

1. Inspect exposed sections for physical damage.
2. Verify cable is supplied and connected in accordance with single line diagram.
3. If cables are terminated through window-type CTs, make an inspection to verify that neutrals and grounds are properly terminated for normal operation of protective devices.
4. Inspect for visual jacket and insulation condition.
5. There shall be no tests performed on existing cable without specific direction from the Engineer.
6. Visually inspect cables, lugs, connectors and all other components for physical damage and proper connections.

7. Check all cable connectors for tightness (with a torque wrench) and clearances. Torque test conductor and bus terminations to manufacturer's recommendations.
- C. Provide electrical tests on conductors as follows:
1. All secondary conductors from the utility transformers to service equipment and all phase conductors 1/0 and larger shall be subjected to insulation tests using a 500 vdc megger.
 2. Check for proper grounding resistance at all services and at transformers. Resistance shall be 2 ohms maximum.
- D. Test results and report shall be provided to the engineer.
- E. Contractor shall correct all deficiencies reported in the test report.

END OF SECTION

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rod electrodes.
2. Active electrodes.
3. Wire.
4. Grounding well components.
5. Mechanical connectors.
6. Exothermic connections.
7. Bus

B. Related Sections:

1. Division 03 – Concrete Reinforcing: Bonding or welding bars when reinforcing steel is used for electrodes.

1.02 REFERENCES

A. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:

1. NFPA 70 - National Electrical Code (NEC), Articles 250 and 517.

C. ANSI/IEEE 142 (Latest edition):

1. Recommended Practice for Grounding of Industrial and Commercial Power Systems.

1.03 SYSTEM DESCRIPTION

- A. All ground and bonding as required by NEC Article 250.**

1.04 SUBMITTALS

- A. Division 01 - Submittal Procedures: Requirements for submittals.**

- B. Product Data: Submit data on grounding connections. Submit data on made electrodes (as defined by NEC) only when made electrodes are required specifically by the project**

Drawings.

- C. Manufacturer's Installation Instructions: Submit for active electrodes.

1.05 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of components and grounding electrodes.

1.06 QUALITY ASSURANCE

- A. Provide grounding materials conforming to requirements of NEC, and listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.
- B. Perform Work in accordance with NEC Article 250 and any other special requirements adopted by Authorities Having Jurisdiction.

1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical and mechanical damage, by storing in original packaging.

1.09 COORDINATION

- A. Division 01 - Administrative Requirements: Requirements for coordination.
- B. Complete grounding and bonding to building reinforcing steel prior to concrete placement.

PART 2 PRODUCTS

2.01 ROD ELECTRODES

- A. Product Description:
 - 1. Material: Copper-clad steel.
 - 2. Diameter: 3/4 inch.
 - 3. Length: 10 feet (3.5 m) minimum. Rod shall be driven at least 9' 6" deep.

4. Connector: Connector for exothermic welded connection or listed U-bolt clamp.
5. Provide only when shown on the Drawings or when made electrodes per NEC Article 250 are required.

2.02 ACTIVE ELECTRODES

A. Manufacturers:

1. Apache Grounding/Erco Inc.
2. Copperweld, Inc.
3. Erco, Inc.
4. O-Z Gedney Co.
5. Thomas & Betts, Electrical

B. Product Description:

1. Material: Metallic-salt-filled copper-tube electrode.
2. Shape: As indicated on Drawings.
3. Length: 8 feet.
4. Connector: Connector for exothermic welded connection or listed compatible U-bolt clamp.

2.03 WIRE

- A. Material: Stranded copper.
- B. Foundation Electrodes/Ufer Grounds: Bare copper sized per NEC Article 250, but not smaller than #2 AWG, or as shown on Drawings.
- C. Grounding Electrode Conductor: Copper conductor bare, sized per NEC Article 250, but not smaller than #2 AWG or as shown on Drawings.
- D. Bonding Conductor: Copper conductor sized per NEC Article 250.
- E. Equipment Grounding Conductors: Insulated copper run with circuit conductors and sized as indicated on the Drawings or per NEC Article 250 where size is not indicated on the Drawings. Provide an equipment grounding conductor in all feeders and branch circuits.

2.04 GROUNDING WELL COMPONENTS

- A. Well Pipe: 8 inches NPS by 24 inches long fiberglass pipe with belled end.
- B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

2.05 MECHANICAL CONNECTORS

A. Manufacturers:

1. Copperweld, Inc.
2. Erico, Inc.
3. ILSCO Corporation
4. O-Z Gedney Co.
5. Thomas & Betts, Electrical

B. Description:

1. The mechanical connector bodies shall be manufactured from high-strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lockwashers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.
2. Split bolt connector types are NOT allowed. Exception: the use of split bolts is acceptable for grounding of wire-basket type cable tray, and for cable shields/straps of medium voltage cable.
3. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.06 EXOTHERMIC CONNECTIONS

A. Manufacturers:

1. Cadweld, Inc.
2. Erico, Inc.

B. Product Description: Listed exothermic materials, accessories and tools for preparing and making permanent field connections between grounding system components.

2.07 GROUNDING BUS

A. Material:

1. Copper (aluminum not permitted).

B. Size:

1. 1/4" X 2" minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

- B. Verify final backfill and compaction has been completed before driving rod electrodes.

3.02 PREPARATION

- A. Remove paint, rust, mill oils, surface contaminants at connection points.
- B. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.
- C. Ground connection surfaces shall be cleaned and all connections shall be made so that they are immovable.
- D. Attach grounds permanently before permanent building service is energized.
- E. All grounding electrode conductors shall be installed in PVC conduit, in exposed locations.

3.03 EXISTING WORK

- A. Modify existing grounding system to maintain continuity to accommodate renovations.
- B. Extend existing grounding system using materials and methods compatible with existing electrical installations, and as specified.

3.04 INSTALLATION

- A. Install in accordance with NEC and in accordance with manufacturer's instructions. Unless specifically indicated otherwise on the Drawings, Contractor may utilize any arrangement of components which fully complies with both.
- B. Install grounding and bonding conductors concealed from view to extent practical.
- C. Install grounding well pipe with cover at rod locations as indicated on Drawings. Install well pipe top flush with finished grade.
- D. Install grounding electrode conductor and connect to reinforcing steel in foundation footing utilizing a connection method listed for the purpose.
- E. Bond together reinforcing steel and metal accessories in pool and fountain structures.
- F. Bond exposed structural steel elements not intentionally grounded as required by NEC 250.104 (C).
- G. Provide code sized copper grounding electrode conductors where required by NEC Article 250.
- H. Install ground grid under access floors where indicated. Construct grid of #4 AWG bare copper wire installed on 72 inch centers both ways. Bond each access floor support pedestal to grid.
- I. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use #4 AWG bare copper conductor.

- J. Equipment Grounding Conductor: Provide separate, insulated equipment grounding conductor within each raceway. Terminate each end on suitable lug, bus, enclosure or bushing. Provide a ground wire from each device to the respective enclosure.
- K. Provide communications system grounding conductor at point of service entrance and connect to building common grounding electrode system.

3.05 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS.
- B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS.
- C. Perform ground resistance testing in accordance with IEEE 142. The following tests are acceptable methods for the resistance-to-ground verification:
 - 1. Clamp-on Induced Frequency Resistance-to-Ground method.
 - 2. 3-point Fall-of-Potential method.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Sleeves.
5. Mechanical sleeve seals.
6. Equipment bases and supports.

B. Related Sections:

1. Division 03 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.

1.2 SUBMITTALS

A. Division 01 - Submittal Procedures: Requirements for submittals.

B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.

C. Product Data:

1. Hangers and Supports: Submit manufacturer's catalog data including load capacity.

D. Design Data: Indicate load carrying capacity of hangers and supports.

E. Manufacturer's Installation Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical and mechanical damage, by storing in original packaging.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads, 1/4" for single conduits 1" and smaller, 3/8" minimum for trapezes and single conduits 1 1/4" and larger.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit Clamps for Trapeze Hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit Clamps - General Purpose: One-hole plated steel for surface-mounted conduits. Provide with malleable iron clamp backs in damp and wet locations. Provide with pre-galvanized finish.
- F. Cable Ties: High-strength nylon temperature rated to 185 degrees F; self-locking.

2.2 FORMED STEEL CHANNEL

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Galvanized 12 gauge thick steel, minimum 1 5/8" x 1 5/8" section when used for trapezes, with holes 1-1/2 inches on center.

2.3 SPRING STEEL CLIPS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Mounting hole and screw closure.

2.4 MECHANICAL AND CONDUIT SLEEVE SEALS

- A. Manufacturers:
 - 1. O-Z/Gedney.
 - 2. Thunderline Link-Seal, Inc.
 - 3. Substitutions: Division 01 - Product Requirements.
- B. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- C. Product Description: Mechanical type, consisting of rubber sealing elements to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:

1. Concrete Structural Elements: Provide precast inserts, expansion anchors or preset inserts.
2. Steel Structural Elements: Provide beam clamps or spring steel clips. Do not drill structural elements unless approved by Structural Engineer.
3. Concrete Surfaces: Provide expansion anchors.
4. Hollow Masonry, Plaster and Gypsum Board Partitions: Provide toggle bolts.
5. Solid Masonry Walls: Provide expansion anchors.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Install conduit and raceway support and spacing in accordance with NEC.

C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit. Do not fasten to suspended ceiling grid system.

D. Install multiple conduit runs on common hangers.

E. Supports:

1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
4. Support vertical conduit at every floor.
5. File and de-bur cut ends of support channel and spray paint with cold galvanized paint to prevent rusting.

F. Install Work in accordance with referenced standards and authority having jurisdiction.

3.3 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 3 inches beyond supported equipment, under all switchboards, motor control centers, floor mounted transformers, and other locations as indicated on the Drawings. Refer to Division 03.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

END OF SECTION

SECTION 26 05 33 - RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Not included in this section: Electrical underground ductbank systems requiring concrete encasement or manholes.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
 - 4. ANSI C80.6 - Intermediate Rigid Conduit
 - 5. ANSI/UL 5 - Surface Metal Raceway
 - 6. ANSI/UL 5 - Surface Non-Metallic Raceway
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, device mounting, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system. Except where other wiring methods are specifically allowed by other sections of the specifications, or specifically indicated on the Drawings, all wiring on this project shall consist of conductors installed in complete raceway systems as specified in this section of the specifications.

1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures.
- B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.

C. Product Data: Submit for the following:

1. Flexible metal conduit.
2. Liquid-tight flexible metal conduit.
3. Non-metallic conduit.
4. Non-metallic tubing.
5. Raceway fittings.
6. Conduit bodies.
7. Surface raceway.
8. Wireway.
9. Pull and junction boxes.
10. Handholes.

1.5 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements.

B. Project Record Documents:

1. Record actual routing of conduits larger than 2 inch (DN50). Include locations of junction and pull boxes.

1.6 DELIVERY, STORAGE AND HANDLING

A. Division 01 - Product Requirements

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.7 COORDINATION

A. Division 01 - Administrative Requirement: Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.

B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes. Coordinate locations with architectural features, the work of other trades, obstructions and constraints. Where specific location information is shown on the Architectural Drawings, the information on those Drawings shall govern.

PART 2 - PRODUCTS

2.1 SELECTION OF PRODUCTS

A. Unless specifically indicated otherwise at particular locations on the Drawings, products shall be selected according to installation conditions as described in this article.

B. Outdoor Below Grade Locations: Non-metallic conduit, schedule 40 or 80.

C. Outdoor Above Grade Locations and other Wet Locations (as defined by the NEC): Rigid steel or intermediate metal conduit (IMC).

- D. Within or Under Concrete Construction Located On or Below Grade: Non-metallic conduit. Comply with Structural Specifications and Drawings regarding limitations on sizes and placement.
- E. Within Concrete Construction Located Above Grade: Non-metallic conduit, rigid steel conduit or intermediate metal conduit. Comply with Structural Specifications and Drawings regarding limitations on sizes and placement.
- F. Damp Locations as defined by the NEC including exposed work in any protected locations directly communicating with outside ambient air such as crawl spaces, breezeways, covered porches, under canopies, and similar locations: Rigid steel or intermediate metal conduits (IMC) conduits.
- G. Interior Dry Locations (as defined by the NEC): Rigid steel, intermediate metal conduits (IMC), or electric metallic tubing.
- H. Motor and Equipment Connections: Liquid-tight conduit not to exceed 6-feet in length.
- I. Lighting Fixtures: Flexible metal conduit.

2.2 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5. Install only where specifically indicated on the Drawings.
- C. Intermediate Metal Conduit (IMC): ANSI C80.1.
- D. The term "metal conduit" does not include Electric Metallic Tubing (EMT).
- E. Fittings: NEMA FB 1; material to match conduit.
- F. Conduit Bodies: NEMA FB 1; shall be malleable iron with steel conduit. Aluminum conduit bodies are not acceptable except for use with aluminum conduit.

2.3 PVC-COATED METAL CONDUIT

- A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil (0.1 mm) thick.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.4 NON-METALLIC CONDUIT

- A. Product Description: NEMA TC 2; Schedule 40 or 80 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.5 FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel or aluminum construction. Lightweight extra flexible type is not acceptable.
- B. Fittings: NEMA FB 1.

2.6 LIQUID-TIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel construction with PVC jacket, UL listed for grounding purposes.
- B. Fittings: NEMA FB 1.

2.7 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1.
 - 1. Indenter and die-cast set screw types are not acceptable.
 - 2. Concealed Dry Locations: Steel set screw, steel compression, die cast compression type.

2.8 SURFACE METAL RACEWAY

- A. Product Description: ANSI/UL 5 sheet metal channel with fitted cover, suitable for use as surface metal raceway.
- B. Size: As indicated on the Drawings.
- C. Finish: Gray enamel.
- D. Fittings, Boxes and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway. Furnish all fittings and accessories required to provide a complete and working system.

2.9 SURFACE NON-METAL RACEWAY

- A. Product Description: ANSI/UL 5A plastic channel with fitted cover, suitable for use as surface metal raceway.
- B. Size: As indicated on the Drawings.
- C. Finish: IVORY.
- D. Fittings, Boxes and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway. Furnish all fittings and accessories required to provide a complete and working system.

2.10 WIREWAY

- A. Product Description: General purpose or NEMA 3R type wireway suitable for installation conditions.
- B. Knockouts: None; provide in field as required.
- C. Size: As indicated on Drawings or as required to meet NEC fill requirements.
- D. Cover: Screw cover.
- E. Fittings: Lay-in type with captive screws.

- F. Finish: Galvanized in mechanical rooms and unfinished areas; gray powder coated in finished areas and outdoors.

2.11 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. 4" square by 2 1/4" deep minimum size. Provide plaster rings of required depth at recessed locations. Provide compatible industrial device covers and blank covers at other locations.
 - 2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch (13 mm) male fixture studs where required.
 - 3. Ceiling Boxes imbedded in concrete: Concrete ring type with top cover
 - 4. Outlet boxes in masonry walls or embedded in concrete: Steel masonry type box.
- B. Cast Boxes: NEMA FB 1, material as specified in articles above. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

2.12 PULL AND JUNCTION BOXES

- A. Above Ground: Sheet Metal Boxes: NEMA OS 1, galvanized steel, NEMA Type 1 or 3R as required by installation location.
- B. In Ground: Fiberglass polymer concrete handhole with concrete polymer composite weatherproof cover with nonskid finish

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

- A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.
- B. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- C. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- D. Extend existing raceway and box installations using materials and methods as specified.
- E. Clean and repair existing raceway and boxes to remain or to be re-installed.

3.3 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.

- C. Identify raceway and boxes in accordance with Section 26 05 53.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION – RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceways; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29 and provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports.
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Route exposed raceway parallel and perpendicular to walls.
- H. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- I. Route raceways in and under slab from point-to-point.
- J. Maintain clearance between raceway and piping for maintenance purposes.
- K. Maintain 12 inch (300 mm) clearance between raceway and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
- L. Cut raceways square using saw or pipe cutter; de-burr cut ends.
- M. Bring raceways to shoulder of fittings; fasten securely.
- N. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe non-metallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- O. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in wet locations.
- P. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate or provide factory elbows for bends in metal conduit larger than 1" size.
- Q. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- R. Install fittings to accommodate expansion and deflection where raceway crosses expansion joints.
- S. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

- T. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- U. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.
- V. Close ends and unused openings in wireway.
- W. Outdoor Below Grade Locations: Burial depth per NEC requirements.
 - 1. Where crossing under or through exterior grade beams utilize only Schedule 80 conduit within 5' of either side of beam.
 - 2. Provide rigid steel or intermediate metal conduit (IMC) elbows at all changes of direction exceeding 30 degrees, including transitions to outdoor above grade locations. Wrap metal conduit with one application, half-lapped, of Minnesota Mining and Manufacturing Company "Scotchwrap" No. 51, Plymouth Rubber Co. "Plywrap 20" or Westape, Inc. 20 mil. Extend tape wrap to a minimum of 6" above grade.
 - 3. Where penetrating exterior walls into basements or finished spaces transition to rigid steel or intermediate metal conduit (IMC) before penetrating wall. Provide an OZ Gedney series "FSK," Link Seal "LS-200" series, or approved equal seal at each penetration location.
- X. Within or Under Concrete Construction Located On or Below Grade:
 - 1. For trade sizes 1" and smaller, transitions to concealed areas above slab may be made with non-metallic elbows and riser nipples. Convert to metallic conduit or tubing within maximum of 18" above slab.
 - 2. For trade sizes 1 1/4" and larger, and all transitions to exposed locations, provide rigid steel or intermediate metal conduit (IMC) elbows.
- Y. Interior Dry Locations (as defined by the NEC): Do not use EMT for exposed work within 48" above finished floor. Do not use EMT for medium voltage cables.
- Z. Lighting Fixtures:
 - 1. Conduit size shall be 1/2" minimum and shall not exceed 6-feet maximum length. Conduit shall be long enough to allow movement of lay-in type fixtures for maintenance purposes.
 - 2. Conduit shall run directly from a junction box to a single fixture. Direct connections between fixtures utilizing flexible metal conduit is not acceptable.
- AA. Flexible metal conduit:
 - 1. Use only in dry locations with minimum length of 1-foot and maximum length of 3-feet for final connections to transformers, motors, and vibrating equipment.
 - 2. Do not install aluminum type in locations less than 6' above finished floor or working surface.
- BB. Liquid-tight flexible metal conduit: Use in wet or dry locations with minimum length of 1-foot and maximum length of 3-feet for final connections to transformers, motors, and vibrating equipment.

3.5 INSTALLATION – BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.

- B. Adjust box location up to 10 feet (3 m) prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 05 27.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) horizontally from ceiling access panel or from removable recessed luminaire.
- F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches (150 mm) separation. Install with minimum 24 inches (600 mm) separation in acoustic rated walls.
- H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- I. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- K. Install adjustable steel channel fasteners for hung ceiling outlet box.
- L. Do not fasten boxes to ceiling support wires or other piping systems.
- M. Support boxes independently of conduit. Provide rigid support to structure for all junction boxes.
- N. Mount junction boxes within 18" of finished ceilings to facilitate future access. Locate junction boxes to allow ready access to junction box covers without removing any equipment.
- O. Install gang box where more than one device is mounted together. Do not use sectional box.
- P. Install gang box with plaster ring for single device outlets.
- Q. Outdoor Above Grade Locations and other Wet Locations (as defined by the NEC): Provide malleable cast iron outlet boxes, "FS" or "FD" series where recessed mounting of outlets is not feasible and for junction boxes in trade sizes 1" and smaller. Utilize malleable iron conduit bodies (condulets) at changes of direction and pull points. Galvanized NEMA 3R steel boxes may be used only at locations where specifically called for on the Drawings, or as approved by the Engineer.
- R. Damp Locations: Provide malleable cast iron outlet boxes, "FS" or "FD" series where recessed mounting of outlets is not feasible and for junction boxes in trade sizes 1" and smaller. Utilize malleable iron conduit bodies (condulets) at changes of direction and pull points. Galvanized steel boxes may be used only at locations where specifically called for on the Drawings.

3.6 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Division 07.
- B. Locate outlet boxes to allow luminaires to be positioned as indicated on the Drawings.

- C. Align adjacent wall mounted outlet boxes for switches, thermostats and similar devices.

3.7 ADJUSTING

- A. Division 01 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused openings in boxes.

3.8 CLEANING

- A. Division 01 - Execution and Closeout Requirements: Final cleaning.
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Underground Warning Tape.
6. Lockout Devices.
7. Panelboard Directories

B. Related Sections:

1. Division 09 - Painting and Coating: Execution requirements for painting specified by this section.
2. Section 26 05 19 – 600-Volt Building Wire and Cable
3. Division 27 – Communications.

1.2 SUBMITTALS

A. Division 01 - Submittal Procedures.

B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.

C. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location and function.

1.3 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Requirements for submittals.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing and protecting products.

B. Accept identification products on site in original containers. Inspect for damage.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements: Environmental conditions affecting products on site.
- B. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color. Use red lettering on nameplates for emergency system components.
- C. Letter Size:
 - 1. Panelboards, Switchboards and Motor Control Centers: 1 inch (25 mm); identify equipment designation. 1/2 inch (13 mm); identify voltage rating, source and room location of the source.
 - 2. Equipment Enclosures: 1 inch (25 mm); identify equipment designation.
 - 3. Circuit Breakers, Switches, and Motor Starters in Panelboards or Switchboards or Motor Control Centers: 1/2 inch (13 mm); identify circuit and load served, including location.
 - 4. Individual Circuit Breakers, Disconnect Switches, Enclosed Switches, and Motor Starters: 1/2 inch (13 mm); identify source and load served.
 - 5. Transformers: 1 inch (25 mm); identify equipment designation. 1/2 inch (13 mm); identify primary and secondary voltages, primary source, and secondary load and location.
- D. Minimum nameplate thickness: 1/8 inch.

2.2 LABELS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Labels: All labels shall be permanent, and machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS ARE ALLOWED. Exception: back side of device plates and junction boxes smaller than 8" X 8" may use handwritten, legible labeling on box covers, unless specifically prohibited by other specification sections.
- C. Embossed tape will not be permitted for any application.

2.3 WIRE MARKERS

- A. Furnish materials in accordance with referenced standards.
- B. Description: Cable label size shall be appropriate for the conductor or cable size(s), outlet faceplate layout and patch panel design. All labels shall be self-laminating, machine generated and be wrapped around the cable or sheath. Flag type labels are not acceptable. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.
- C. Legend:

1. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams.
- D. Tape (phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.

2.4 CONDUIT AND RACEWAY MARKERS

- A. Furnish materials in accordance with referenced standards.
- B. Description: Nameplate fastened with adhesive, labels fastened with adhesive and stencils.
- C. Color:
 1. Medium Voltage System: Black lettering on white background.
 2. 480 Volt System: Black lettering on white background.
 3. 208 Volt System: Black lettering on white background.
- D. Legend:
 1. Medium Voltage System: HIGH VOLTAGE.
 2. 480 Volt System: 480 VOLTS.
 3. 208 Volt System: 208 VOLTS.

2.5 UNDERGROUND WARNING TAPE

- A. Provide detectable underground warning tape, yellow background, black letters, 6" width, equal to Ideal #42-251, with suitable warning legend describing buried electrical lines.

2.6 LOCKOUT DEVICES

- A. Lockout Hasps:
 1. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

2.7 PANELBOARD DIRECTORIES

- A. Typed directories for panels must be covered with clear plastic, have a metal frame. Room number on directories shall be Owner's numbers, not Plan numbers unless Owner so specifies.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Division 09 for stencil painting.

3.2 EXISTING WORK

- A. Install identification on existing equipment to remain in accordance with this section.
- B. Install identification on unmarked existing equipment.

- C. Replace lost nameplates, labels and markers.
- D. Re-stencil existing equipment.

3.3 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
 - 1. Install nameplate parallel to equipment lines.
 - 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
 - 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
 - 4. Secure nameplate to equipment front using adhesive.
 - 5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
 - 6. Install nameplates for the following:
 - a. Panelboards.
 - b. Transformers.
 - c. Disconnects.
 - d. Motor Control Centers.
 - 7. Nameplates shall include equipment designation, supply voltage, secondary voltage (for transformers) and feeder source designation.
- C. Label Installation:
 - 1. Install label parallel to equipment lines.
 - 2. Install label for identification of individual control device stations.
 - 3. Install labels for permanent adhesion and seal with clear lacquer.
 - 4. Install label for receptacles and light switches indicating serving panelboard and circuit number.
- D. Wire Marker Installation:
 - 1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes.
 - 2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
 - 3. Install labels at data outlets identifying patch panel and port designation.
- E. Underground Warning Tape Installation:
 - 1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Wall switches; receptacles; multi-outlet assembly; and device plates and decorative box covers.
 - 1. Wall Switches.
 - 2. Floor boxes.
 - 3. Receptacles.
 - 4. Device Plates, Covers and Colors.
 - 5. Multi Outlet Assembly.
- B. Related Sections:
 - 1. Section 26 05 33 - Raceway and Boxes for Electrical Systems: Outlet boxes for wiring devices.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA WD 1 - General Requirements for Wiring Devices.
 - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.
 - 3. UL 498 - Receptacles
 - 4. UL 20 - Switches

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures.
- B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.
- C. Product Data: Submit manufacturer's catalog information showing dimensions, colors and configurations.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section.

1.5 EXTRA MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two of each style, size and finish wall plate.

1.6 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Requirements for warranties.

- B. Furnish five-year manufacturer warranty for components.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:
 - 1. Cooper: CSB Series.
 - 2. Hubbell: CSB Series.
 - 3. Pass and Seymour: CSB Series.
 - 4. Substitutions: Division 01 - Product Requirements.
- B. Product Description: NEMA WD 1, Commercial Spec Grade AC only general-use snap switch, side and back wired.
- C. Body and Handle: Plastic with toggle handle, unless otherwise noted on plans. Use red for devices connected to emergency systems.
- D. Indicator Light: Lighted handle type switch, where shown on plans.
- E. Ratings:
 - 1. Voltage: 120-277 volts, AC.
 - 2. Current: 20 amperes.

2.2 FLOOR BOXES

- A. On-Grade Floor Box
 - 1. Manufacturers:
 - a. Wiremold.
 - b. Hubbell.
 - c. Substitutions: Division 01 - Product Requirements.
 - 2. Receptacles: NEMA WD 6, type 5-20R, duplex receptacle.
 - 3. Cover: Surface, nickel finish.
- B. Poke-Thru
 - 1. Manufacturers:
 - a. Wiremold.
 - b. Hubbell.
 - c. Substitutions: Division 01 - Product Requirements.
 - 2. Receptacles: NEMA WD 6, type 5-20R, duplex receptacle.
 - 3. Cover: Surface, nickel finish.

2.3 RECEPTACLES

- A. Duplex Receptacle

1. Product Description: NEMA WD 1, Commercial Spec grade receptacle, 20 amp.
2. Configuration: NEMA WD 6, side and back wired.
3. Device Body: Plastic, unless otherwise noted on Drawings.
4. Manufacturers:
 - a. Legrand
 - b. Cooper
 - c. Hubbell
 - d. Substitutions: Division 01 - Product Requirements.

B. Simplex Receptacle

1. Product Description: NEMA WD 1, Commercial Spec Grade receptacle, 20 amp.
2. Configuration: NEMA WD 6, side and back wired.
3. Device Body: Plastic, unless otherwise noted on Drawings.
4. Manufacturers:
 - a. Cooper: 1877 Series
 - b. Hubbell, HBL 5261 Series
 - c. Leviton: 5891 Series
 - d. Pass and Seymour: 5361 Series
 - e. Substitutions: Division 01 - Product Requirements.

C. GFCI Receptacle

1. Product Description: NEMA WD 1, Heavy-duty general use receptacle, 20 amp. Provide with weather-resistant rating when located outdoors.
2. Configuration: NEMA WD 6, UL943, side and back wired, feed thru type.
3. Device Body: Plastic, unless otherwise noted on Drawings.
4. Manufacturers:
 - a. Cooper: VGF20 Series
 - b. Hubbell: GF20L Series
 - c. Leviton: 8898 Series
 - d. Pass and Seymour: 2095 Series
 - e. Substitutions: Division 01 - Product Requirements.

D. Twist Lock Receptacle

1. Product Description: NEMA Lx-xx, UL 94, Twist Lock receptacle.
2. Configuration: NEMA type as indicated on Drawings.
3. Device Body: Black plastic, unless otherwise noted on Drawings.
4. Manufacturers:
 - a. Cooper
 - b. Hubbell
 - c. Leviton.
 - d. Pass and Seymour
 - e. Substitutions: Division 01 - Product Requirements.

E. Special Purpose Receptacle

1. Product Description: Heavy-duty Special Purpose Receptacle, Straight Blade or Pin and Sleeve Type.

- 2. Configuration:
 - a. Range receptacle: NEMA 14-50
 - b. Dryer receptacle: NEMA 14-30
 - c. Other types: As indicated on drawings.
- 3. Device Body: Black plastic, unless otherwise noted on Drawings.
- 4. Manufacturers:
 - a. Cooper.
 - b. Hubbell.
 - c. Leviton.
 - d. Pass and Seymour.
 - e. Substitutions: Division 01 - Product Requirements.

2.4 DEVICE PLATES, COVERS AND COLORS

- A. Manufacturers: To match device manufacturer.
- B. Device Colors:
 - 1. Wall Devices: White
 - 2. Ceiling Devices: White
- C. Decorative Cover Plate: Smooth nylon with mounting screw(s).
- D. Jumbo Cover Plate: Smooth nylon with mounting screw(s). For use at masonry walls only.
- E. Weather Resistant Cover Plate: Gasketed cast metal plate with hinged and gasketed device cover. Provide weatherproof-while-in-use type covers where indicated on the Drawings.

2.5 MULTI-OUTLET ASSEMBLY

- A. Manufacturers: Wiremold.
 - 1. Substitutions: Division 01 - Product Requirements.
- B. Receptacles: NEMA WD 6, type 5-15R, duplex receptacle.
- C. Receptacle Spacing: As indicated on Drawings.
- D. Receptacle Color: White.
- E. Channel Finish: White.
- F. Fittings: Furnish manufacturer's standard couplings, elbows, outlet and device boxes, and connectors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.

- B. Verify outlet boxes are installed at proper height.
- C. Verify wall openings are neatly cut and completely covered by wall plates.
- D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Clean debris from outlet boxes.

3.3 EXISTING WORK

- A. Disconnect and remove abandoned wiring devices.
- B. Modify installation to maintain access to existing wiring devices to remain active.
- C. Clean and repair existing wiring devices to remain or to be reinstalled.

3.4 INSTALLATION

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install receptacles with grounding pole on top.
- D. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.
- E. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- F. Connect wiring devices by wrapping solid conductor around screw terminal. When stranded conductors are used in lieu of solid, use back wiring connections. Do not place bare stranded conductors directly under device screws.
- G. Use jumbo size plates for outlets installed in masonry walls.
- H. Install galvanized steel covers on outlet boxes and junction boxes in unfinished areas and above accessible ceilings.
- I. Section 26 05 53 - Identification for Electrical Systems

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 26 05 33 to obtain mounting heights as specified.

3.6 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and Division 01 - Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.
- B. Inspect each wiring device for defects.

- C. Operate each wall switch with circuit energized and verify proper operation.
- D. Verify each receptacle device is energized.
- E. Test each receptacle device for proper polarity and ground.
- F. Test each GFCI receptacle device for proper operation.

3.7 ADJUSTING

- A. Division 01 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust devices and wall plates to be flush and level.
- C. Division 01 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- D. Test each system component after installation to verify proper operation.
- E. Test relays, contactors and switches after installation to confirm proper operation. Provide sensitivity adjustments on motion sensors to avoid nuisance, undesired operation.
- F. Confirm correct loads are recorded on directory card in each panel.

3.8 CLEANING

- A. Division 01 - Execution and Closeout Requirements: Final cleaning.
- B. Clean exposed surfaces to remove splatters and restore finish.

3.9 DEMONSTRATION

- A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate operation of the following system components:
 - 1. Operation of switches.
- C. Furnish 4 hours to instruct Owner's personnel in operation and maintenance of system. Schedule training with Owner, provide at least 7 days' notice to Architect/Engineer and Owner of training date.

END OF SECTION

SECTION 26 28 13 - 250 & 600-VOLT FUSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes 250- and 600-volt fuses and spare fuse cabinet.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures.
- B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.
- C. Product Data: Submit data sheets showing electrical characteristics, including time-current curves.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual sizes, ratings and locations of fuses.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years of experience.

1.6 MAINTENANCE MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two fuse pullers.

1.7 MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Requirements for extra materials.
- B. Furnish three spare fuses of each class, size and rating installed.

PART 2 - PRODUCTS

2.1 FUSES

- A. Manufacturers:

1. Bussman.
2. Littlefuse.
3. Shawmut.
4. Substitutions: Division 01 - Product Requirements.

- B. Dimensions and Performance: NEMA FU 1, class as specified or as indicated on Drawings.
- C. Voltage: Rating suitable for circuit phase-to-phase voltage.
- D. Interrupting Rating for all Fuses: 200,000 rms amperes minimum.

2.2 CLASS RK1 FUSES

- A. Bussman Type LPN-RK__SP (250V), LPS-RK__SP (600V) or equivalent
- B. Dimensions and Performance: UL Class RK1, NEMA FU 1, current limiting.
- C. Time Delay: 10 seconds minimum at 500% rated current.
- D. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.3 CLASS RK5 FUSES

- A. Bussman Type FRN-R (250V), FRS-R (600V), or equivalent
- B. Dimensions and Performance: UL Class RK1, NEMA FU 1, moderate current limiting.
- C. Time Delay: 10 seconds minimum at 500% rated current.
- D. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.4 CLASS L (TIME DELAY) FUSES

- A. Bussman Type KRP-C__SP or equivalent
- B. Construction: silver links with sand filler.
- C. Dimensions and Performance: UL Class L, NEMA FU 1.
- D. Time Delay: 4 seconds minimum at 500% rated current.
- E. Interrupting Rating: 300,000 RMS symmetrical.

2.5 CLASS J (TIME DELAY) FUSES

- A. Bussman Type LPJ__SP, or equivalent
- B. Time Delay: 10 seconds minimum at 500% rated current.
- C. Dimensions and Performance: UL Class J, NEMA FU 1.
- D. Interrupting Rating: 200,000 RMS symmetrical minimum.

PART 3 - EXECUTION

3.1 EXISTING WORK

- A. Remove fuses from abandoned circuits.
- B. Maintain access to existing fuses and other installations remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

- A. Install fuse with label oriented so manufacturer, type and size are easily read.

END OF SECTION

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fusible switches, non-fusible switches, and molded case and insulated case circuit breakers in individual enclosures.
- B. Related Sections:
 - 1. Section 26 28 13 - Fuses.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 3. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures.
- B. Specification Review: Provide a complete item by item, line by line specification review indicating compliance with the specifications and note any deviations from the specification with reason for deviation.
- C. Product Data: Submit switch ratings and enclosure dimensions.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of enclosed switches and circuit breakers with ratings of installed fuses.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCH ASSEMBLIES

- A. Manufacturers:
 - 1. Eaton/Cutler Hammer.
 - 2. ABB/General Electric.
 - 3. Schneider Electric/Square D.
 - 4. Substitutions: Division 01 - Product Requirements

- B. Product Description: NEMA KS 1, heavy-duty enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
- D. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R or 4 as noted on plans.
- E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
- F. Furnish switches with entirely copper current carrying parts.

2.2 NON-FUSIBLE SWITCH ASSEMBLIES

- A. Manufacturers:
 - 1. Eaton/Cutler Hammer.
 - 2. ABB/General Electric.
 - 3. Schneider Electric/Square D.
 - 4. Substitutions: Division 01 - Product Requirements
- B. Product Description: NEMA KS 1, heavy-duty enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R or 4 as noted on plans.
- D. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
- E. Furnish switches with entirely copper current carrying parts.

2.3 SWITCH RATINGS

- A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.
- B. Short Circuit Current Rating: UL listed for 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

2.4 MOLDED CASE CIRCUIT BREAKER

- A. Manufacturers:
 - 1. Eaton/Cutler Hammer.
 - 2. ABB/General Electric.

3. Schneider Electric/Square D.
 4. Substitutions: Division 01 - Product Requirements.
- B. Product Description: Enclosed, molded-case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where applied.
- C. Service Conditions:
1. Temperature: 104 degrees F maximum.
 2. Altitude: 6,000 feet maximum.
- D. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjustment as noted on Drawings.
- E. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.
- F. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; and delays as noted on Drawings.
- G. Current Limiter: Designed for application with molded case circuit breaker.
1. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
 2. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.
- H. Accessories: As indicated on Drawings. Conform to NEMA AB 1. Typical devices include breaker locks, pad lock provisions, auxiliary switch, shunt-trip operators, and others as indicated.
- I. Enclosure: NEMA AB 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
 2. Exterior Locations: Type 3R or 4 or as noted on Drawings.
- J. Service Entrance: Circuit breakers identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

PART 3 - EXECUTION

3.1 EXISTING WORK

- A. Disconnect and remove abandoned enclosed switches and circuit breakers.
- B. Maintain access to existing enclosed switches and circuit breakers and other installations remaining active and requiring access. Modify installation or provide access panel.
- C. Clean and repair existing enclosed switches to remain or to be reinstalled.

3.2 INSTALLATION

- A. Install enclosed switches and circuit breakers plumb. Provide supports in accordance with Section 26 05 29.
- B. Height: 5 feet to operating handle.
- C. Install fuses for fusible disconnect switches. Refer to Section 26 28 13 for product requirements.
- D. Install engraved plastic nameplates in accordance with Section 26 05 53.
- E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.3 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and Division 01 - Execution and Closeout Requirements: Field inspecting, testing and adjusting.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.

3.4 ADJUSTING

- A. Division 01 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust trip settings to coordinate circuit breakers with other overcurrent protective devices in circuit.
- C. Adjust trip settings to provide adequate protection from overcurrent and fault currents

END OF SECTION